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TWO CEYLON PROBLEMS.

Address by Mr. R. N. Lyne, Director of Agriculture, to the Ceylon Agricultural Society, July 3, 1912.

It was my intention to write nothing and to say as little as possible till I had been some months on the island, because a new-comer can have very little to say worth listening to about the agriculture of a country till he has had time to study it. I accepted the invitation of the Secretary of the Society to address this meeting because I felt sure you would be generous in your criticisms and listen to what I have to say on the understanding that further acquaintance with Ceylon may cause me to modify the views I shall express to you. I especially appeal to the indulgence of the experienced rubber planters present, as I recognize that it savours somewhat of presumption for a man who has been but six weeks in the country to venture to address them on the cultivation of Hevea. But there are many problems connected with the cultivation and tapping of rubber which the new Department of Agriculture will, I hope, apply itsef to solve or help to solve. Though we have established rubber planting in Ceylon on a paying basis, I feel myself on safe ground when I say that we know very little about the right treatment of the Hevea tree. Lawes and Gilbert pursued their patient researches for several decades before venturing to pronounce nitrogen the dominant manure for wheat or potash for clover. Wheat feeds in the top few inches of the soil and occupies the land but a few months. Hevea searches a vast area in comparison and continues for three-quarter of a century, perhaps more. How long then are we to be allowed before pronouncing upon

THE DOMINANT MANURE FOR HEVEA?

It is the eliminating of the subsidiary influences that requires the time, and in the case of tree growth these influences are very complex. We may be attributing results to manure that in reality are due to a generous rainfall two years back; because how long the influence of a good or bad rainfall may extend with large trees whose roots work in regions far beyond our reach, we cannot say. In the old

country we studied plants that grew in a medium we could plough and till and we equipped our laboratory and wrote our text books on the experience gained therein. In a tropical country with a good rainfall like Ceylon, nature works in a laboratory of her own, exceeding in dimensions everything with which we have had any previous experience. We must enter her laboratory as students, remembering that she yields up her secrets grudgingly. Some years ago I sent home a sample of soil to Dr. Voelker, consulting chemist to the Royal Agricultural Society of England. He reported that the soil was completely impoverished, deficient in all the ingredients of plant food, and it was a wonder anything grew upon it. I replied that the soil supported a rich clove plantation, and added that it seemed to me that in the tropics soil was of less importance than a proper balance of sun and rain; and he answered that, when in India the same thought had occurred to him. We have brought in for exhibition some rubber, the product of one month's tapping of

A HEVEA TREE AT HENARATGODA,

It weighs 18 lb. This tree goes on yielding in that proportion six months or more in the year. In $3\frac{1}{2}$ years it yielded 275 lb. of rubber. What is the cause of this? I have heard it described as a freak, but I do not accept that solution. If we had been planting rubber for a hundred years, or if this tree stood in a plantation of 100,000 others of like age and size, we might be justified in regarding it as a freak; but there are only a few trees on the island that can rank as its peers, and these are grouped round it. It is one of the original consignment imported from Brazil. This tree has never been manured: therefore manure has had nothing to do with its remarkable yield. It grows on rather poor soil: therefore its abundant flow of latex is not due to exceptional richness of soil. We can thus eliminate three influences: individual peculiarity, manure, soil, and say that none of these has had anything to do with the rich return of this Hevea tree. What remains? To what other conditions is vigorous tree growth due?

LIGHT, AIR AND ROOM

are three, and this tree, standing on the outside of the plantation, enjoys a liberal supply of all of these. Leaves cannot perform their functions without light, and other things being equal we may take it that the more light they receive during the hours of daylight, the more work they will do and the more vigorous will the circulation of the tree become. The same may be said of air, while it will be obvious that the less the soil preserves of a tree are encroached upon by neighbours, the greater will be the stores of plant food at its disposal to draw upon. But the most important factor of tree vitality yet remains to be indicated, namely, moisture. In the tropics fertility follows in the track of the rain; and one of the functions of rain is to keep the water table at its normal level. It is not unlikely that this large and vigorous Hevea may have succeeded in tapping subterranean reservoirs as yet out of reach of its companions. Now if this is so and had this tree been subjected to systematic manuring, root development might have been encouraged towards the surface instead of towards the deeper layers of the soil, and in that case the water table might never have been reached. We have here then a hypothetical case, and it seems to me not at all an unreasonable one, in which

MANURING MIGHT ACTUALLY HAVE DONE HARM,

instead of good. You cannot, of course, argue from one tree, especially a tree that is a generation older than most rubber trees on the island; I have only taken it to illustrate the point I wish particularly to make, which is, that in the presence of natural forces working so very much more vigorously than we have been accustomed to in temperate climates, where the science of agriculture has been built up, it is possible we may be devoting too much attention to what I will term the artificial side of rubber cultivation—manuring and methods of tapping, and that we might achieve better results at first by devoting our energies more to removing

obstacles from the path of nature and giving her rein. We should endeavour to secure as far as we can that nature has full scope for the use of her vast resources with each individual tree in the plantation, and that each individual tree is given full play for the utmost exercise of its functions. After that we may begin cautiously to offer her assistance with such puny means as we have at our disposal, being ever watchful that, instead of helping her, we may not be hampering her.

Agricultural Education.

I now come to agricultural education, *i.e.*, agricultural instruction of the native population of Ceylon to which (as His Excellency has remarked) the new Department will also have to devote its attention. The improving of native methods of agriculture, it is thought by some, is a disappointing task to undertake; but it is a movement we cannot resist. The British Empire and all countries with responsibilities in the tropics are taking it up and it appears to me that in Ceylon we have got material to work upon which compares very favourably with that of some other countries that I know. But in approaching this question of agricultural education we should make up our minds not to expect results too soon. How long has it taken Hodge in England to capitulate to scientific agriculture? He is slowly giving in, but he is not by any means completely conquered yet, though more than two centuries have elapsed since Jethro Tull published his book on "Horse-hoeing Husbandry." Let us not forget that till the dawn of the eighteenth century we ourselves remained in outer darkness. In one respect I notice the native races of Ceylon ahead of the native races of East Africa, namely, in the knowledge that manure promotes plant growth, and, speaking under correction, I believe this is due, at least to some extent, to the teaching they are receiving in the school gardens and through the instructors of the Agricultural Society.

In East Africa

natives understand nothing about manures and I have never seen goat or cattle manure used in their gardens. In a visit I recently paid to a school garden I was quite struck by the knowledge some of the boys displayed about the value of manuring.

Next to securing ourselves against disappointment and despair by making up our minds to be patient and remember that "by slow degrees we reach the steep declivities of time," I place the importance of becoming thoroughly acquainted with native methods.

In most respects,—not in all, because in some cases, as for example manures, ignorance alone has been the obstacle—but in most respects native customs are the outcome of long experience, of particular physical constitution, of village or domestic circumstances, and hence are not to be hastily condemned.

The writer of "Romans" said that tribulation worketh patience; and patience experience; and experience hope; and I should like to relate a story of tribulation in which I was concerned because it led on to useful experience.

Clove Planting in Zanzibar.

When I first went to Zanzibar I laid out a clove plantation of 10,000 trees. Every tree was planted under the supervision of an experienced English nurseryman. The Arabs came to look at us and we felt we were providing them with a useful object lesson;—as indeed we were. When the trees were all planted and shaded, we waited and watched while they began to die. In three months all had perished except 10 per cent. After that instead of the Arabs coming to look at us we went to look at the Arabs. Not only in planting but in plucking and drying; though we tried new systems we had to go back to Arab methods and pick them up where they had dropped them thirty years before when their supply of slaves began to decline and their prosperity to wane. We improved upon them, but the methods were theirs.

You probably know the story of the West Indian planter who introduced wheel barrows as labour-saving devices. His coolies accepted them confidingly, filled them with earth and hoisted them on to their heads. They knew their business; according to his lights the native cultivator knows his business. It is *our* business to try and understand his motives. Patience and an understanding of the motives of the natives are then important items of our equipment. What, now, of the line of attack? In the first place I would aim at improving existing methods rather than at introducing new ones, and I would apply this principale especially in the case of implements.

NATIVE PLOUGH.

Let us take the native paddy plough for example and endeavour to improve it as a labour-saving implement before placing in his hands an entirely new machine and let us make sure that it really is labour-saving. There is a tendency sometimes to condemn the native when he rejects the expression of our ideas of what is good for him, but I am convinced that the fault is often ours for having failed to study the case in all its aspects. A new sort of plough may be able to turn over more land and yet be unable to stand the rough treatment and neglect it must inevitably suffer in native hands, quickly getting out of order and hence be anything but a labour-saving device or an improvement. The native peasant understands little or nothing about bolts or screws or nuts. His paddy plough is one wedged unit. It is light, weighing but 25 lb. and at the corners he can jerk it with one hand a distance of 6 feet to begin the next headland; and when he has finished he can swing it on to his shoulder and walk away with it. I never saw a European-made iron plough that could be handled like this, and yet unless we can give him an implement that he can so handle he will reject it, because it will not be really labour-saving. Again, the action in the paddy fields is not a ploughing action, it is a churning action, corresponding more to that of a cultivator with one tine, so that when offering the native one of our ploughs in place of his own we may be—indeed I think we are—offering him quite a different kind of implement for which he has no use.

THE INSTRUCTION OF THE YOUNG.

I come now to what is perhaps the most important point of all in agricultural education; and that is, teaching the young generation. It is in the coming generation the fruit will ripen, not in our day; though it may be our privilege to till the soil. Much can, I think, be done by a simple course of agricultural instruction in teaching boys the functions of the roots, stems, leaves and flowers of plants, for example; how plants feed; what it is the soil is composed of; the reason for cultivating and manuring it; and instructing boys in the use of modern implements. For given results it will take an enormously greater expenditure of force and money with the adult native settled into his ways than with the impressionable young who have nothing to unlearn. But before attempting to teach the young we have to educate the teachers, and this fact places the whole question of agricultural education in its proper perspective. The vista is seen to be a long one, indeed.

Elliott & Fry.

R. N. Lyne, F.L.S., F.R.G.S., Director of Agriculture, Ceylon.

SYNTHETIC RUBBER.

The Times' View.

The public are probably but dimly aware of the extent to which chemical research, often carried on for years in directions which seem far removed from any practical issue, now enters into their daily lives and dominates great departments of industry. Now and again, however, some notable discovery appeals to the imagination of the most careless observer. Most people are more or less aware of the

DEVELOPMENT OF THE ANILINE DYES,

though they possibly fail to connect them with the innumerable tabloids of strange drugs to which they have recourse upon all sorts of occasions. The discovery of synthetic indigo is perhaps less generally appreciated, though it is painfully familiar to indigo-planters in India. Now we have the announcement of a method of producing synthetic rubber upon a commercial scale and at a price which will enable it to compete with the natural product. So many people are interested in the shares of rubber companies that this newest

TRIUMPH OF CHEMICAL RESEARCH

has commanded very general attention. Capital is proverbially shy and anything that appears likely to affect an established industry is sure to be scanned with the keenest interest. It need hardly be said that everybody who shares in that interest would do well to keep a cool head and to await developments. Apart, however, from its bearing upon great financial undertakings, the present announcement is extremely interesting. The actual

PROBLEM OF MAKING RUBBER ARTIFICIALLY

was solved some time ago. It has been made and tested by use in motor-tires and things of that kind. But the chemist, though he can imitate nature's products, cannot command nature's methods. He cannot begin, as the plant does, with the crude elements, and build them up into complicated structures with no other energy than that derived from the sunlight. He has to take manufactured material from nature, and has to expend upon it a great amount of energy also derived from the manufactured material of nature. With all these advantages he can bring about some wonderful transformations; but, before he can make them pay, he has to discover some natural product to begin upon, which is very abundant and cheap in comparison with his finished product. The difficulty in the case of rubber has been to find some sufficiently cheap natural product to use as raw material, and that is the difficulty which is now believed to have been surmounted.

ENGLISH CHEMISTS.

The steps are very interesting and include several distinct advances in knowledge, and that too in very different departments. What adds further to the interest, we might almost say the romance, of the matter, is that rival chemists in different countries have been running neck-and-neck in the race for commercial success. A strong body of English chemists has been at work, with the aid of a French bacteriologist, who has contributed an improved fermentation process the details of which are secret, for the abundant production of the higher alcohols from starch. On the other hand German chemists have been pursuing parallel, if not identical, lines of research, and both parties are protecting themselves by patents which may not improbably furnish occupation for the lawyers. It is very probable that more than one rubber is in question, and quite possible that none of them is in every respect identical with natural rubber. The German chemists, we believe, recognize this variability in composition, and hesitate to put forth on behalf of their product the claim that it is identical with natural rubber,

PROFESSOR WYNDHAM DUNSTAN

points out to-day in our columns that some at least of the proposed sources of

synthetic rubber cannot yield the five carbon atoms present in the molecule of natural rubber. That does not prevent them from yielding a homologous substance which may have very valuable rubber qualities. Even when the five atoms are present it does not follow that they are combined in precisely the same way as in natural rubber. It is common to find two very different substances composed of exactly the same elements in exactly the same proportions. They differ in structure, It is also common to

FIND MINUTE STRUCTURAL DIFFERENCES

in what seems to be the same substance—albumen for example—coming from different sources. Broadly speaking, the samples are all albumen, but in special conditions they behave differently. It must be remembered that natural rubber is not a single uniform and homogeneous product. It comes from various plants, and their different products are recognized in the market as having different properties, no doubt related to different structure or composition. There is room for different synthetic rubbers, which may follow any one of different natural types, or may differ for better or for worse from them all.

ASSUMPTION THAT A CHEAPER PROCESS POSSIBLE.

It may be assumed that a process much cheaper than was previously known has now been worked out. But whether it is yet sufficiently cheap to compete with the natural rubber at present prices, and at the reduced prices which may be expected in the future, is another question altogether. The most careful anticipatory estimates of cost are liable to be greatly exceeded when the thing comes to be worked. Nothing can absolutely settle the question of cost, and therefore of commercial success, except actual production upon a considerable scale. The situation as it stands is extremely interesting, but is not devoid of a well-marked element of speculation. From the great advance already made chemists may, however, draw encouragement to prosecute their researches still further, with a view to securing yet greater cheapness of raw material. The ultimate victory will rest with the man who succeeds in accomplishing some further simplification.

SINHALESE LABOUR ON ESTATES.

A correspondent, who desires to remain anonyous, raises the following points, which seem to us of sufficient importance to merit serious discussion :—

Can you give me any instances where Sinhalese labour from distant villages has on a large scale been induced to settle down as a resident labour force on Estates—Tea or Rubber—permanently on the footing say, for instance, of Tamils from the Coast?

Is there, in your opinion, any possibility or prospect of obtaining such a resident force of Sinhalese as a permanency for large properties of 1000 acres or more?

If such is the case, or likely, what possible safeguards are available to prevent them from at any time abandoning the Estate at a day's notice? Can they be bound as in the case of emigrant labour? Would it in fact be safe to rely solely or chiefly on such a force?

[We do not know of any estate on a large scale which is run entirely by Sinhalese labour, although the number of Sinhalese employed on estates in supplement of the permanent Tamil force is rapidly increasing. Such labourers we believe generally work by the day without any definite contract. Under Section 7 *et seq* of Ordinance 11 of 1865 it would be possible to enter into a written agreement with each labourer separately, but this would scarcely be feasible on a large scale.

Personally we think that a great deal might be done with Sinhalese labour in certain districts by a tactful manager who understands the ways of the native, but to depend upon them entirely for running a large estate would be a rather hazardous proceeding under present conditions.—ED.]

THE SOLOMON ISLANDS "GUADA" BEAN AS A VEGETABLE.

Burring Bar, New South Wales, Australia, 10th June, 1912.

To the Editor of the
Tropical Agriculturist.

Sir,—Having grown the above bean during the past year, with great success, and knowing how beneficial it would prove to many planters in the East Indies and elsewhere, kindly permit me to give you a brief description thereof. My attention was first drawn to this matter by reading the following paragraph in one of our local papers giving a description of the above Islands, "On the kitchen table is an enormous bean. It is seven feet long and is named the 'Guada.' Both the pod and the beans are edible, and are sliced and cooked like French beans. This green, succulent o oking delicious streak, is intended for our host's family dinner to-night. It will provide amply sufficient vegetables for one meal, for half a dozen hungry people."

DESCRIPTIONS.

This vine grows from 15 to 20 feet long and within a few months yields a heavy crop of beans from 3 to 6 feet in length; which greatly resemble a long, narrow cucumber. The flowers are fringed and scented, and when over-ripe the pods assume various hues—organe-red and green with white stripes; when young the fruit acts as a good substitute for cucumbers when pickled. A writer in one of our local papers of recent date says:—"I can testify to their value as a table vegetable. Mr. Harrison gave me one bean in January last; from this single seed I have grown about 25 lbs. of beans from the one vine, which is growing and bearing heavily yet. Single beans have measured up to 5 feet 4 in. in length and to 2 lbs. in weight, and we have frequently served up half a bean for a meal. It is usual to expect coarse flesh and rank flavour in such bulky vegetables, but such is not the case with the "Guada." If taken before the beans have hardened in the pod, sliced and cooked like French beans, and served with sauce it is quite a luxury in the bean line."

This vegetable should prove a most useful and prolific adjunct to gardens in the East Indies, and other tropical countries where it is sometimes very difficult to cultivate kitchen produce.

Yours faithfully,
B. HARRISON.

[In another letter our correspondent calls this bean *Tricho-santhese anguina*, which is, of course, the Snake Gourd, well known throughout the East and a native of India, though not usually attaining to the dimensions described here. *T. columbrina* grows to 5 or 6 feet however.—ED.]

FUNGOID DISEASES OF CULTIVATED PLANTS.

The increasing attention given to plant diseases is one of the most striking (and unexpected) of recent advances in British Agriculture. But after so many years of neglect, native information on such matters was necessarily meagre, being almost limited to the researches of a very few voluntary workers; and under these circumstances there was a distinct opportunity for the introduction of

STANDARD TEXT BOOKS

by experienced plant pathologists in other countries. Messrs. Bailliere, Tindall & Cox have taken advantage of that opportunity to issue a translation of a popular hand-book by Prof. Eriksson, Director of the Botanical Division of the Swedish Central Agricultural Station, who has a high reputation as a Mycologist, and is especially renowned for his

RESEARCHES ON THE RUSTS OF CEREALS.

The book is well arranged and excellently illustrated. A diagnostic key to the diseases of each plant—a new feature in works of this kind—is given, and with the assistance of that and the numerous figures, the practical man will have little difficulty in gaining some idea of the nature of any diseases which may be attacking his crops. The general

style of the book is a credit to the publishers, and one can only regret that they did not have the translation revised by an Englishman; as it stands, it might serve a double purpose by affording correction exercises in English grammar and composition for rural schools.

In Plant Pathology,

as in other subjects, the day of the encyclopædia has passed. Prof. Eriksson's book deals only with the diseases of field crops in temperate climates, and is therefore the more valuable, since these can receive fuller individual treatment than is possible in a work which professes to include all known diseases. But this limitation renders impossible any recommendations of the book to the readers of the *Tropical Agriculturist* (in spite of the translator's numerous references to "planters" since, except possibly for the section on club root, they would find in it nothing of interest, or at least of practical use, to them.

The following

Extracts from the Author's Preface

gives the views of this experienced plant pathologist on a subject which is often debated by planters:—

"Nowadays we frequently hear the complaint that the diseases of our cultivated plants become year by year more numerous and more disastrous. It is alleged that new diseases are constantly turning up which have never before been seen or heard of. It is also said that parasitic fungi, which hitherto have proved quite harmless, have changed their nature, and become most destructive.

"Is this really the case, or is it not? Some hold this opinion to be erroneous, and claim that the state is the same as before, but that greater attention and the strict investigation which now are given to this study bring the matter more before the public eye, and also result in the discoveries of hitherto unnoticed diseases.

"This explanation can hardly be gainsaid. In most civilised countries there is now a diligent survey and a close inspection of the health of cultivated plants, and this attention must result in a detection of diseases that have been previously unnoticed. But, on the other hand, there are many cases that cannot be placed summarily in this category. And this refers especially to a great number of the

"Fungoid Diseases.

"It is, after all, an incontestable fact that fresh fungoid diseases have recently appeared and are gaining a footing in various countries. How is this to be explained? Several causes work simultaneously to this end.

"The inclination in our time for specialisation, even with regard to agriculture, inasmuch as only one or a few species are cultivated in large masses, helps to make the plants more susceptible. This mass-culture of varieties and sorts generates new characteristics in the individual plants, and some of these new forms will then be more suscpetible to diseases and become a source of disease for the whole plantation.

"But another important fact must be placed side by side with this.

"The Law of Evolution

is known and accepted as truth in the scientific world. Formerly it was thought that hundreds and even thousands of years were required for this evolution. But to-day we are certain that new forms can be brought forth through impulsive new formation—'mutation'—and these forms can vary from the parent stock in one or more characteristics. Why could not this natural law be applied also to the extensive dominion of the parasitic fungi? And why could not these new forms of fungi possess qualities that would enable them to avail themselves of the nourishment offered through the new races of hostplants brought about by the mass-cultivation? This is quite possible, and recent experiments and observations tend to prove this supposition.

"Beside these two purely scientific explanations, we have the practical

"one of the easy communication of our "days, by means of which contagious "matter can be readily spread from one "district, country or continent, to an- "other.

"The combined effects of these circum- "stances render the research and the "prevention of fungoid diseases a matter "of international importance."

T. P.

SYNTHETIC RUBBER.
VIEW OF THE *FINANCIAL TIMES*.

ANOTHER VIEW.

In the last three days the Bogey of synthetic rubber, which it may be remembered, was markedly in evidence a few weeks before the commencement of the great rubber boom of 1909-10, has once more been prominently brought forward, as a result of the lecture given by Professor W. H. Perkin, of the Manchester University before the London Section of the Society of Chemical Industry on Monday last followed by the interview on the same subject given by Sir William Ramsay to a representative of the "Morning Post." Coming on an already rather tired market, these detailed statements that

ARTIFICIAL RUBBER

could be commercially produced at a price much below that at present ruling for the natural article, has caused something like a slump in the shares of plantation companies, and we hear that many real holders have hurriedly sold their investments. We have no hesitation in saying that, on the statements so far put forward, this slump is altogether unjustified; and we hope that none of our readers have allowed themselves to be frightened out of desirable holdings by the *ipse dixit* of a scientist, however eminent. Synthetic rubber is, after all, no new thing; it has been manufactured in the laboratories again and again, and the only actual step forward which has been taken lies in the claim that the process has been so perfected that it may be possible to market synthetic rubber manufactured from starch at a price of

SOMETHING UNDER 2*s*. 6*d*. PER LB.

It is not even claimed, however, that the essential figures with regard to the cost of production are anything more than vaguest estimates and the more recent past has produced plenty of examples of such scientific hopes having been badly disappointed when put to the test of practical experience, the Dunderlan Iron Ore Company being a prominent example. In the present instance the first invention of practical utility is that which Professor Fernbach, of the Pasteur Institute in Paris, claims to have discovered—namely, a method by which

BUTYL ALCOHOL—A FORM OF FUSEL OIL

—can be manufctured at a cost of approximately £30 per ton. As the cost by existing methods is £130 per ton, this represents a big saving, but we have no information yet as to how the estimate has been arrived at, what was the proportion of costs allowed for manufacturing processes, or whether any allowance was made for the value of the by-product—Acetone. The other discovery lies in the

REDUCTION OF ISOPRENE

—which by a somewhat lengthy chemical process is refined from Butyl alcohol —to rubber by the application of sodium. Sodium is not a widely used commercial product, and is, it may be remarked, so difficult to handle that it has to be protected from the air by a coating of paraffin and secured in closely fitting soldered-up tinned boxes. In a laboratory such difficulties are easily overcome, but quite a different problem is presented when the material has to be used in comparatively large quantities. Nor are the prices at present ruling for the different materials required any gauge of what might have to be paid if a big demand were created. In some instances, of course, additional demand tends to lower prices by increasing the supply, but in the case of many chemicals sold as by-products the ordinary supply is limited, and much higher

prices would have to be paid for direct manufacture.

THE POINT

which it is necessary to make is that any calculation of the cost of a given product by means of laboratory experiments is necessarily very conjectural. In this case it is more than usually so. Professor Perkin admitted that the whole question was in an experimental stage, and apparently assuming that the discovery of Professor Fernbach would reduce the price of Butyl alcohol from £130 to £30 per ton, he did not go further than to suggest that "there was a probability" that synthetic rubber could be produced at 2*s*. 6*d* per lb. and "a possibility" of production at a cost of 1*s*. per lb. Sir William Ramsay, though very optimistic, intimated that at least two years of experimental work is ahead before a

MANUFACTURING PLANT

can be commenced. And the company which, it is stated, is being formed will apparently occupy itself not primarily in the production of rubber but in testing commercially the first stage of the process, namely the production of cheap butyl-alcohol and acetone—the latter being a valuale ingredient in the manufacture of smokeless powder. If and when that problem is successfully solved, the question of the commercial production of synthetic rubber will begin to come within the range of practical politics, provided that the chemical processes do not prove too expensive; and possibly by that time we may have some evidence as to

WHETHER THE ARTIFICIAL IS EQUAL TO THE NATURAL PRODUCT.

Natural rubber differs enormously in value, and quite possibly the artificial product might not find a market at 2*s*. or 3*s*. below the price of hard Para. This, of course, can only be ascertained in course of time, and the fact which Rubber shareholders should bear in mind is that the lecture of Professor Perkin on "the production and polymerisation of isoprene and its homologues", did not carry us further than a suggestion that a way had been found by which

IT MIGHT, SOME YEARS HENCE,

be possible to manufacture chemical rubber at a comparatively low figure.

It may be useful in this connection to recall the history of the production of nitrate from the air, which was once a similar periodical bogey to holders of Nitrate shares. In the course of years the mechanical difficulties were in that case actually solved (after a good deal of money had been lost in the process), and nitrate of lime, produced by electricity from the air, is now being manufactured and sold in considerable quantities. It has, however, had no effect whatever upon the price of nitrate of soda, and the market entirely disregards the development of the industry which was once its bugbear. In the same way, it is probable that twelve months hence the present

SCARE WITH REGARD TO SYNTHETIC RUBBER

will be forgotten and it is long odds against any sufficient quantity of such material being produced as to affect prices for many years to come. In the meantime holders of Rubber shares should disregard the alarmist statements which have been circulated, the more so as they do not appear to be altogether disinterested. Advance prospectuses of a venture called the

SYNTHETIC PRODUCTS MANUFACTURING COMPANY

are now being privately circulated, the capital being a modest half-million, while Sir William Ramsay heads the list of Directors. This, perhaps, accounts for the publicity which has been given the scientific discoveries said to have been made, but, at the same time synthetic rubber is, in the preliminary document, merely held out as a dream of the future, the estimates of profits being based on the manufacture and sale of acetone and fusel oil distilled from starch. That being the case, it would have been, perhaps, as well if rubber had been kept rather more in the background than it has been.

USE OF EXPLOSIVES IN AGRICULTURE.

It has been usual till lately to give dynamite a wide berth, but now the explosive has come to be considered a useful adjunct of agriculture, and the demand for it in the preparation of lands bids fair to surpass that for mining purposes. The various uses to which it is put are for tree-planting, subsoiling, ditching, removal of old tree stumps, boulder blasting, road-making, &c. The three first mentioned are perhaps the most important and will therefore be described in detail.

Tree Planting.

Among the different kinds of soils met with are some of a shallow description underlaid by a hard pan or at least a compact impervious subsoil. In such soils the roots have practically to confine themselves to the surface soil for their food supply, which naturally gets rapidly exhausted.

In many cases the subsoil is rich in plant food—potash, phosphoric acid, lime, &c.—but in the absence of water which cannot penetrate the hard under-surface these supplies are not available to the plants, since moisture is a *sine qua non* for the solution and absorption of plant food.

The U. S. A. Experiments

have shown that frequently the soil contains ·05 and ·07 % of phosphorus and potash respectively, while 3 or 4 feet below the percentage rises to ·15 and 1·3.

In using dynamite for tree-planting a hole 4 to 5 feet deep and 1¼ to 1½ inches in diameter is first made, at the bottom of which the cartridge is placed provided with detonator and fuse, and the hole well filled in. The result of the explosion is that on the removal of the loosened earth not only is a suitable hole for planting found, but the ground is fissured for a considerable distance from the hole and the compact layer disintegrated.

It has been observed that trees planted in land prepared in this way thrive very much better than those put in holes prepared in the usual way. The roots are found to be larger and more vigorous, being free to spread in all directions. Water can now penetrate the soil and dissolve out the plant food stored up there, while at the same time an underground reservoir of moisture is found which bids fair to render the trees drought-resistant.

The Breaking up of the Soil

in this manner is possible even in planted up lands carrying old non-bearing trees standing in an impoverished soil with a hard subsoil below, and has been done with good results in crops.

Soils prepared by digging are opened to a depth of about 18 inches or 2 feet, while with dynamite they are loosened to a depth of 3 or 4 ft., and at less cost. It has been estimated that in America the cost of dynamiting land is between £ 2·10 and £5 per acre according to the nature of the soil treated.

It has further been found that where supplies have been put into holes prepared by dynamite to replace trees killed by insects or fungoid pests, the new trees have not been troubled by the pests.

Subsoiling for Cereal and other Crops.

For this purpose the holes are prepared from 15 to 25 ft. apart, and the operation could be carried out even with a standing crop if the holes are made deep enough.

Digging Ditches.

For this holes are dug along the line of ditch at intervals of from 1 to 2 ft. and to a depth of 18" to 2ft. according to nature of soil and requirements for ditch. For very wide ditches more than one row of holes is provided.—(Summarized from *Agricultural Journal of the Union of S. Africa.*)

FERTILITY OF THE SOIL.

THREE STAGES IN FARMING.

At the Royal Institution last night Mr. A. D. Hall, F.R.S., read a paper on "Recent Advances in Agricultural Science," with particular reference to the fertility of the soil.

The fertility of the soil, he said, was the outcome of a very complex series of factors, including the actual supply of plant food in the soil, its mechanical texture as conditioning the movements of water, and the particular micro-fauna and flora inhabiting the soil, for upon these lower organisms depended the facility with which the material contained in the soil became available for the

NUTRITION OF THE PLANT.

Dealing with the question of the duration of the fertility of the land under continual cropping, the lecturer said that the United States had begun to take alarm about the reduced production of some of its most fertile lands, as, for instance, the old prairie lands of the Middle West—a reduced production which, among other causes, had helped to set in motion a stream of migrants from the United States to the newer lands of the Canadian North-West. In the development of agriculture three distinct stages might be observed. There was the pure

EXPLOITATION OF THE INITIAL RESOURCES

of the soil, when the farmer was to all intents and purposes mining in its fertility. This was the process which had been going on in America and in all the newer countries. Farming of that kind was destructive; but in the older lands of the West of Europe, which had been long under cultivation, a conservative system had been devised which was capable of keeping up the productive power of the soil, though not, perhaps, to a very high pitch. The best example of this could be seen in the Norfolk four-course rotation before the introduction of artificial fertilizers. This conservative farming about 1840 began to give place to the

THIRD STAGE IN THE DEVELOPMENT—INTENSIVE FARMING—

rendered possible by the discovery of artificial fertilizers and the cheap freights which brought cheap feeding-stuffs to the soil of this country. By these means the average production of the land of the British Isles had been raised from the 20-bushel level to something over 30 bushels, and the most intensive farmers reach an average level at least 25 per cent. higher. In their case the soil had become practically a manufacturing medium transforming the nitrogen and other fertilizing materials added to it into crops, giving nothing to those crops from its original stock, and, indeed, up to a certain point gaining rather than losing fertility with each year's cultivation. The research work of Drs. Russell and Hutchinson at Rothamsted justified them in believing that they could so rearrange the micro-fauna and flora of the soil as to obtain a much higher duty from the reserves of nitrogen contained in them.—*London Times* May 25th, 1912.

THE PROGRESS OF HORTICULTURAL SCIENCE.

The *Gardener's Chronicle* of June 1st, commenting on the last International Horticultural Exhibition held in London, makes certain reflections on the progress of Horticultural Science since the previous exhibition held 46 years ago.

The complaint of the practical gardener would seem to be that the scientist has little to teach him in the management of his plants beyond, perhaps, giving him such information as relates to the proper use of artificial manures and the eradication of pests: but it is pointed out that the scientist is laying the foundation of an edifice which is going to prove a great store house of knowledge to the horticulturist,

To quote the words of the *Chronicle*: "The mysteries of the soil are being unravelled; the garden pests begin to tremble at their impending destruction; the secrets of immunity from disease are in course of discovery, and though the patient hybridist may even now afford to ignore the laws which Mendel gave us, the time is not far off when he may discover that the work according to those laws is to achieve his ends more surely than by waiting on the gifts of chance . . . . Horticultural Science is not a thing apart but a factor, and an increasing factor, in horticultural development."

PROTECTION OF INDIAN CATTLE.

We have received from Mr. K. S. Jassawalla, President-Founder of the British Association for the Protection of Indian Cattle, certain publications issued by him with a view to explaining the cause he advocates, and enlisting the sympathy of the public in the object he seeks to bring about.

The following extract will serve to give an idea of the proposed reform:—"The main thing is to improve the agriculture of India, and to do this it is absolutely necessary to improve and increase the breed of oxen which do all the agricultural work. Now, so long as the slaughter of the cow and the she-buffalo is not prohibited, it is impossible to have a sufficient number and a good breed of oxen to turn out sufficient raw material for the English factories, and to render the factories independent of American cotton-growers. It should be borne in mind that I am not asking for total abolition, but only for the substitution of Australian for American beef for British troops."

CHILDREN'S GARDENS.

The International Children's School Farm League of New York has for its object to promote and unify a world-wide interest in Children's Gardens in suitable parks and vacant lots, in connection with schools, hospitals and institutions, and for children who are mentally or physically weak or deficient, and to urge the employment of teachers trained to garden work. The President and Vice-Presidents of the League are ladies who have in their Secretary (Mrs. Parsons), a lecturer and practical adviser. Mrs. Parsons, who conducts a summer course for teachers, defines a children's garden as "a place where children grow flowers and vegetables under the guidance of a person trained to show them Nature's laws in operation, and also to show them how to apply knowledge of these laws in the work and observation of life." This is the very object which our School Gardens, of which there are now over 200 in Ceylon, are intended to serve.

AMERICAN AGRICULTURAL COLLEGES.

Since 1910 the number of institutions in the United States concerned with agricultural education has almost trebled. From 364 the number has increased to 2,546—an increase at the average rate of 76 per mensem.

The collegiate courses have not appreciably increased, and there are at present sixty one of these.

The largest increase has been among

INSTITUTIONS OFFERING SECONDARY OR PRACTICAL COURSES

among which are 40 of privately endowed colleges. These do not compete with the State Colleges which number 2,154 compared with 360 in 1910. Normal schools and schools for Indians have been omitted from the list as their work is of an elementary nature.

Of purely technical agricultural schools of the secondary grade there are 88 private, and 80 maintained wholly or partly by State funds at a cost of 780,000 dollars per annum for instruction and maintenance, excluding land, buildings and equipment. These institutions

definitely prepare young men for farming and young women for home duties. Of elementary schools in which agriculture is taught there are many hundreds. 12 States have passed laws requiring the

TEACHING OF AGRICULTURE IN ALL COMMON SCHOOLS,

five others require it in all the rural schools, and 3 in the rural high schools.

The two chief difficulties as regards agricultural teaching is the training of teachers and their proper remuneration. Sixteen States have passed laws requiring that all teachers should qualify in agriculture. State normal schools do what they can to prepare them, but there is not sufficient provision to deal with the

LARGE NUMBER OF TEACHERS.

Trained teachers for high schools are also scarce—the graduates from the College finding better opportunities in farming or at Agricultural Stations than as ordinary teachers. Conditions and prospects are better in the case of special Agricultural Schools, and courses subsidised by the State to attract trained men.

Experience would seem to indicate that teachers now in service have after a short course of agricultural training become very successful teachers of agriculture.—(Summarized from *U. S. A. Department of Agriculture.*)

BEE WARFARE.

Mr. J. I. Lutes speaks of a very common trouble, viz., "old bees killing off young bees." I think that, if he will examine his brood-combs carefully, he will find them infested with mothworm, for the mode of attack of the mothworm, and the habit of bees in relation to their presence in the hive, are not always understood. For this reason there is a great deal of brood destroyed by them unobserved.

THE OVULES OF THE MILLER

are deposited in the cells, or carried by the bees in going in and out, are sealed over, and hatch coincidentally with the bees. The young worms feed on the pap of the larvæ; and as they grow larger they burrow and push their way from cell to cell under the capping of the brood; forming elevated lines that may be seen crossing the surface of the capped brood. These lines vary in diameter from 1/16th to 3/32nds of an inch, and constitute the runways of the worms. There are two important points to remember—first that

BEES NEVER ATTACK THE MOTHWORM

until it is seen; second, moth-worms instinctively remain secreted behind the cappings of the brood until they reach full development and are ready for the last transformation. They then emerge, make excursions about the hive in search of a crack, depression or hole, where they spin their silken cocoon. It is then the bees attack them and carry them out. But all the damage they can do is done.

BEES WILL CLUSTER OVER DOZENS OF MOTHWORMS

secreted in these runways, day after day, with no apparent knowledge of their presence; nor make any attempt to remove them while their brood is being destroyed. The worms do not eat the young bees, but rob them of their food, so that most of those die over which they burrow. But if the larva is sufficiently developed to live the bee will be defective, often minus one or both wings, or so dry that it emerges with difficulty, having a segment of the cocoon adherent to its body. It is a law of the hive that they

TOLERATE NO INVALIDS OR IMPERFECT BEES

in the colony; therefore these are carried out to become the prey of carnivorous ants.

It is the duty of the bee-keeper to examine his brood-combs now and then for these tell-tale elevated runways on the surface of the capped brood, especially when bees are carrying out dead larvæ or young bees.

When a colony is found infested, it will require bi-weekly examinations for

four to six weeks to eradicate them. I had one very strong colony of the best Italians last summer, in a new hive with beautiful frames of brood that became infested, and I removed, in all, 114 worms from beneath the cappings of the brood. It required six weeks to eradicate them. I would find from four to fourteen worms at an examination.

The Best Tool to Operate with is a delicate sharp-pointed hook formed on the end of a steel wire about 6 inches long. With this you can rip up the runways from end to end without injury to the brood, and turn out the worm. When operating, turn the worm loose among the bees and see how they will pounce upon it and attempt to sting and carry it away.—*Gleanings in Bee Culture.*

PLANTATION *VS.* WILD RUBBER.

"Gummi-Zeitung" remarks that owing to the production of rubber in other lands under different conditions, Brazilian minimum prices do not affect the question. Not only is wild rubber being exploited in Africa, East India, Central and South America, but plantation is extending in Malaya, Ceylon, Africa, &c.

"Pure Para" is being used on a diminished scale and requirements are in a few years likely to be met almost exclusively from plantation rubber. According to German opinion the outlook for Brazilian rubber is by no means hopeful, since plantation rubber costs less to produce.

Rubber Investments, and Production.

Today there are 700,000 acres planted with rubber, of which 450,000 are in Eastern Asia and its Islands. It has been estimated that there are in Great Britain and the colonies over 1,200 companies employed in the industry, with a normal capital of 250 million dollars.

The shipments from the F. M. S. for the first 10 months of the last 3 years were—4,831,823 pounds in 1909, 9,824,605 in 1910, and 15,443,154 in 1911.

Germany has a capital of 12,500,000 dollars invested in rubber. In 1909 German East Africa exported 218 tons of plantation rubber, and 255 of wild rubber. In 1910, that Colony had 41,000 acres in rubber; Kamerum 10,000, New Guinea 5,500, Samao, 2000; Togo, about 375. Of this acreage only about 1/6th is in bearing. The total exports of rubber and gutta percha from the German colonies was in 1909, 2150 tons, value 2,875,000 dollars: the value for 1910 being about 3,750,000.

In 1916 or 1917 we shall probably see which comes out top—whether wild, plantation, or artificial rubber. The victory will lie with material which gives the manufacturer the best quality at the lowest price.—*India Rubber Journal.*

RUBBER PRODUCTION CONSIDERED IN RELATION TO HEALTH.

It has been said that every ton of rubber costs a human life. If this be so then in the country of Amazon there must be a sacrifice of 40,000 souls each year—which is hardly thinkable. Considering existing conditions, however, it is not improbable that at least half that number of human beings succumb each year to the attendant hardships. Fever, beri-beri, wild animals, snakes, poisonous insects, bad food and water and the lack of remedial and preventative measures all contribute to this end.

Plantation Conditions Favourable.

Against this must be contrasted the favourable conditions as regards diet and sanitation on plantations. Here rubber growing instead of being destructive to life is a preserver of health. It is not to the point to enquire whether this is due to humanitarianism or to commercial policy.

Though conditions in wild-rubber countries are undoubtedly improving every year, it will never be possible to render such regions as immune from risks as plantations. The increase of plantations not only makes for the commercial stability of the industry but for its humaneness.—(Summarized from *India Rubber Journal.*)

TOBACCO IN SIAM.

Tobacco is grown most extensively in the provinces of Petchaboon and Rajburi. The leaf produced in Petchaboon town is regarded as superior to that produced elsewhere.

The tobacco is of two qualities, strong and mild, the former being used both for smoking and chewing. For cigarettes wrappers of lotus, banana and betel are employed. Mild tobacco is used solely for chewing with betel and arecanut.

The chief market is Bankok whither the tobacco is brought by boat: and much of the leaf finds its way inland. Occasionally Siamese tobacco is shipped to Cochin, China, Hongkong, and Malaya: but the bulk is consumed locally.

The soils usually selected as suitable for cultivation are bamboo forests, scrub land and high grass land. The best soil, according to the American Consul, is a loam—sandy, or black and yellow colour. On such a soil tobacco is said to be grown from 20 years consecutively without fertilisers.

Transplanting from the nursery takes place from November to February according to locality, the high lands being planted first and the low last, since the former get rid of their moisture sooner.

Crops are harvested in March or April. Two or three of the top leaves are reserved for a special high-class tobacco. For a uniform grade all the leaves are shorn off at once: otherwise the picking is done from below upwards.

After being ribbed the leaves are placed on top of each other, rolled up and put away for two days, then unrolled and packed one above the other to a height of 6 feet. Round pieces of wood are pressed on the top of the leaves which are rolled into the shape of cylinders: the wood rollers are then taken out and the leaves dried in the shade for about 3 days. They are then finely cut and dried in the sun for a day. For a strong dark leaf the sun-drying is extended to 3 days.—(Summarized from *Journal of the Royal Society of Arts.*)

EXHIBITS FROM THE ALL-CEYLON EXHIBITION, PRESENTED TO THE PERADENIYA MUSEUM,

BY MR. C. E. TENNAKOON RATEMAHATMEYA.

(*A*) JUNGLE ROPES MADE FROM FIBRE OF THE FOLLOWING PLANTS :—

1	Creeper.	Derris Scandens, *Benth.* ...	Kala-wel, S.
2	do	Combretum ovalifolium, *Roxb.* ...	Kadura-ketiya wel, S.
3	do	Strychnos cinnamomifolia, *Thw.* .	Eta-kirindiwel, S.
4	do	Calamus Rotang, *L.* ...	Wewel, S.
5	do	Anamirta paniculata, *Colebr.* ...	Titta-wel, S,
6	do	Flagellaria indica, *L.* ...	Goyi-wel, S.
7	do	Toddalia Aculeata, *Pers.* ...	Kudu-miris, S.
8	do	Erycibe paniculata, *Roxb.* ...	Etamyria, S.
9	do	Dalbergia Pseudo-sissoo, *Miq.* ...	Bambara-wel, S.
10	do	Connarus monocarpus, *L.* ...	Radaliya, S.
11	do	Sarcostemma Brunonianum, *W&A.*	Muwa-kiriya, S.
12	do	Willughbeia zeylanica, *Thw.* ...	Kiri-wel, S.
13	do	Coscinium fenestratum, *Colebr.* ...	Weni-wel, S,
14	do	Pothos scandens, *L.* ...	Pota-wel, S.
15	do	Ipomaea cymosa *Roem.* ...	Madu-wel, S.
16	do	Ancistrocladus vahlii, *Arn.* ...	Gona-wel; S.
17	do	Nepenthes distillatoria, *L.* ...	Bandura-wel, S.

18	Creepers.	Delima sarmentosa, *L.*	Korosawel, S.
19	do	Entada scandens, *Benth.*	Pus-wel, S.
20	do	Rourea santaloides, *W. & A.*	Kirindi-wel, S.
21	do	Boerhaavia diffusa, *L.*	Pitasudupala-wel, S.
22	do	Acacia cæsia, *Willd.*	Hinguru-wel, S.
23	do	Smilax zeylanica, *L.*	Babarasa-wel, S.
24	Barks.	Helicteres Isora, *L.*	Liniya-patta, S.
25	do	Gyrinops Walla, *Gaertn.*	Walla-patta, S.
26	do	Allæanthus zeylanicus, *Thw.*	Alandu-patta, S.
27	do	Careya arborea, *Roxb.*	Kahata-patta, S.
28	do	Sterculia Balanghas, *L.*	Nava-patta, S.
29	do	Hibiscus tiliaceus, *L.*	Beli-patta, S.
30	do	Antiaris innoxia, *Bl.*	Riti-patta, S.
31	do	Derris uliginosa, *Benth.*	Kala-patta, S.
32	do	Entada scandens, *Benth.*	Pus-patta, S.
33	do	Hibiscus abelmoschus, *L.*	Kapu-kinissa patta, S.
34	do	Calotropis gigantea, *Br.*	Wara-patta, S.
35	do	Grewia microcos, *L.*	Kéliya-patta, S.
36	do	Sterculia foetida, *L.*	Telambu-patta, S.
37	do	Bauhinia racemosa, *Lam.*	Mayila-patta, S.
38	do	Grewia tiliæfolia, *Vahl.*	Daminiya-patta, S.
39	do	Pterospermum suberifolium, *Lam.*	Welanga-patta, S.
40	do	Ficus altissima, *Bl.*	Nuga-patta, S.
41	do	Derris oblonga, *Benth.*	Sudu-kala-wel patta, S.
42	do	Abutilon asiaticum, *G. Don.*	Anoda-patta, S.
43	do	Ficus Tsiela, *Roxb.*	Ehetu-patta, S.
44	do	Dalbergia Championii *Thw.*	Bambara-patta, S.
45	do	Artocarpus lakoocha, *Roxb.*	Kana gonna-patta, S.
46	do	Crotalaria juncea, *L.*	Hana, S.
47	do	Sansevieria zeylanica, *Willd.*	Niyanda-patta, S., 2 ropes.
48	do	Caryota urens, *L.*	Kitul-kendi, S., 2 ropes.
49	do	Furcrea gigantea, *Vent.*	Goni-pithi kendi, S. (rope)
50	do	Sansevieria zeylanica, *Wild.*	Niyanda, S., 1 coloured rope.
51	do	Crotalaria juncea, *L.*	Hana, S., 1 coloured rope.
52	do	Cocos nucifera. *L.*	Pol-kendi, S., Coir rope.

(B) ROPES MADE OF HIDE.

1 Elk hide rope for noosing leg of cattle.
2 Deer hide rope for noosing neck of cattle.
3 Elk and deer hide rope for noosing elephant.

(C) NOSE STRINGS FOR CATTLE, MADE OF DIFFERENT KINDS OF BARKS.

1	Ananas sativum, *Schult.*	Annasi, S. Pineapple.
2	Eriodendron anfractuosum, *D. C.*	Kotta pulun, S. White cotton.
3	Ficus religiosa, *L.*	Bo, S.
4	Pterospermum suberifolium, *Lam.*	Welan or welanga, S.
5	Grewia microcos, *L.*	Kéliya, S.
6	Furcraea gigantea, *Vent.*	Perun-Kathali, T.
7	Anacardium occidentale, *L.*	Caju, S.
8	Bassia longifolia, *L.*	Mi-gas, S.
9	Nerium Oleander, *L.*	Araliya, S. Oleander 2 string.
10	Crinum asiaticum, *L.*	Tolabo, S.
11	Calotropis gigantea, *Br.*	Wara, S.
12	Morus alba, *L.* var. indica, *L.*	Indian Mulberry.

13	Gossypium barbadense, *L.*	... Kapu, S. Sea Island cotton.
14	Sterculia Balanghas, *L.*	... Nava, S.
15	Cyathocalyx zeylanicus, *Champ.*	... Kekala, S.
16	Derris scandens, *Benth.*	... Kala-wel, S.
17	Crotalaria juncea, *L.*	... Hana, S.
18	Borassus flabellifer, *L.*	... Tel, or Tela, S.
19	Hibiscus Rosa-sinensis, *L.*	... Wada-mal, S. Shoe-flower.
20	Rourea santaloides, *W & A*	... Kirindi-wel, S.
21	Musa paradisiaca, *L.*	... Kehel, S. Plantain.
22	Ficus altissima, *Bl.*	... Nuga, S.
23	Stephegyne tubulosa, *Hk. F.*	... Helamba, S.
24	Ficus glomerata, *Roxb.*	... Attikka, S.
25	Tamarindus indica, *L.*	... Syambala, S.
26	Hibiscus tiliaceus, *L.*	... Beli patta, S.
27	Helicteres Isora, *L.*	... Liniya, S.
28	Corchorus capsularis, *L.*	... Jute
29	Pongamia glabra, *Vent.*	... Karanda or Magul-Karanda, S.
30	Thespesia populnea, *Corr.*	... Suriya, S. Tulip.
31	Dalbergia Pseudo-sissoo, *Miq.*	... Bambara-wel, S.
32	Cocos nucifera, *L.*	... Pol-kohu, lanu, S.
33	Entada scandens, *Benth.*	... Pus-wel, S.
34	Acacia caesia, *Willd.*	... Hinguru-wel, S.
35	Bauhinia racemosa, *Lam.*	... Mayila, S.
36	Ficus heterophylla, *L.*	... Wal-nuga or wel-ehetu.
37	Moringa pterygosperma, *Gaertn.*	... Murunga, S.
38	Pandanus zeylanicus, *Solms.*	... Weta Keyiya or O. Keyiya.

(D) Samples of Fibres.

1	Sterculia Balanghas, *L.*	... Nava, S.
2	Acacia caesia, *Wild.*	... Wel-Hinguru, S.
3	Dalbergia Pseudo-sissoo, *Miq*	... Bambara-wel. S.
4	Musa paradisiaca, *L.*	... Kehel, S.
5	Debregeasia velutina, *Gaudich.*	... Gas dul, S.
6	Eriodendron anfractuosum, *D. C.*	... Kotta pulun, S.
7	Calotropis gigantea, *Br.*	... Wara-patta, S.
8	Hibiscus tiliaceus, *L.*	... Beli patta, S.
9	Careya arborea, *Roxb.*	... Kahata Patta.
10	Gyrinops Walla, *Gaertn.*	... Walla, S.
11	Sansevieria zeylanica, *Willd.*	... Niyanda Kendi, S.
12	Caryota urens, *L.*	... Kitul Kendi, S.
13	Ananas sativum, *Schult.*	... Annasi, S. Pineapple.
14	Entada scandens, *Benth.*	... Pus-wel, S.
15	Triumfetta rhomboidea, *Jacq.*	... Epala, S.
16	Corypha umbraculifera, *L.*	... Tala Kendi, S.
17	Anodendron paniculatum, *A. Dc.*	... Dul or Gerandi dul, S.
18	Furcraea gigantea, *Vent.*	... Goni Kendi, S.
19	Ficus altissima, *Bl.*	... Nuga, S.
20	Crotalaria juncea, *L.*	... Hana, S.
21	Hibiscus esculentus, *L.*	... Bandakkai, S.

POULTRY BREEDS AND AVERAGES.

The following table shows details of the egg production of the various breeds concerned and their averages at an Egg laying competition, South Australia, 1911-12.

No. of Pens.	No. of Birds.	Breeds.	Total Eggs Laid.	Average per Pen.	Average per Hen.
34	204	White Leghorns ..	35,938	1,057·0	176·16
6	24	Silver Wyandottes ..	4,611	768·5	128·08
6	24	Black Orpingtons ..	4,223	703·8	117·3
1	6	Langshans ...	938	938·0	156·3

COTTON FORECASTS.

UNITED STATES.—The condition of the cotton crop on May 25th was 78·9 % of a *normal* as compared with 87·8 % at the same date last year, and with 81·5 % the average condition on May 25th, for the last 10 years. This month's condition is equal to 97 on the Institute's scale against 108 at the same date last year.

AFRICA.

EGYPT.—The low temperature during May had an unfavourable influence on the cotton crop which has now lost the advance that it had gained.

The cotton worm has appeared to a small extent in the Delta, and the boll worm is prevalent in one province of Lower Egypt.—*Bulletin of Agricultural Statistics.*

EDUCATION IN RURAL SCHOOLS.

For some time past, the need has been felt in the West Indies for improvement in the educational methods employed, in rural schools particularly. The same circumstance has existed in Great Britain, where a stage in progress has been marked recently by the issue of a Memorandum on the Principles and Methods of Rural Education by the Board of Education, England. In England, the distinctions between the circumstances surrounding schools in towns and those in the country are much greater than the differences which obtain in the West Indies, where almost all commercial effort is directly

CONNECTED WITH AGRICULTURE.

The same general principles apply nevertheless in both cases, and actually in a broader degree in the West Indies; and it will be well to see in what way several of the matters in the Memorandum mentioned may be made useful in regard to West Indian conditions.

Dealing first with rural elementary schools, there has been in late years, in England, a desire to make the teaching more practical in nature and, although this has been effected from small beginnings, many of the schools employ in large measure the

GREAT WEALTH OF MATERIAL

supplied by the conditions surrounding them. In such cases the teacher is continuing to receive education, in the best sense, at the same time as the pupil, and the chief requisites for his success are a real interest in the affairs in which he finds himself placed and willingness and courage to undertake experiments and to benefit by what others may have to teach him.

It has been pointed out already in this journal that the chief effort in such matters should be to make the teaching possess an intimate connexion with the

DAILY CIRCUMSTANCES WITH WHICH THE PUPIL COMES INTO CONTACT.

The adoption of this method will supply abundant material for dealing with nearly all the subjects that are commonly found in the curriculum of an elementary school. Further, a lively interest will be given to these subjects, in that the pupil will be made to see in what way they are of use to him in the conditions of the ordinary

course of his life. Lessons in English arithmetic, geography, history, and especially nature study, will all be simplified in character and increased in interest if they are made to relate as far as possible to those conditions. Further, with respect to nature study, this is the subject which lends itself particularly to the provision of assistance with geography, practical arithmetic and drawing. It may be said that the fact is recognized in several parts of the West Indies, and that the employment of the

SCHOOL GARDEN IN RELATION TO THE GENERAL CURRICULUM

of the school has reached a degree that was not imagined when it was first suggested that school gardening should be taken up on a general scale.

Turning now to a consideration of practical work in rural secondary schools, some of the first efforts were made in a small part of England by engaging the county horticultural lecturer to teach practical horticulture in a few of the schools. The results have been disappointing, chiefly on account of the fact that the adoption of the scheme led to the detachment of certain boys from the regular work of the school. The danger of this was recognized early in the West Indies, so that the agricultural and science

MASTERS FIRST APPOINTED UNDER THE IMPERIAL DEPARTMENT OF AGRICULTURE

were definitely placed on the teaching staff of the school in which their work was to be done and their classes were included in the ordinary school curriculum. The principle was extended further in order to prevent the appearance of detachment of any of the pupils in the school by making every boy take up at least one science subject during the whole of his time at school; so that later, when there came to be specialization in the direction of agriculture on the part of some of the pupils, these did not appear to be detached from the ordinary interests of the school any more than others who happened to specialize in subjects that are not agricultural. Another matter that was recognized by the Imperial Department of Agriculture at the beginning was that the

COURSE OF SCIENCE

in these schools should be actually fundamental to agriculture and the Memorandum mentioned shows that the importance of this principle has been appreciated in England for it states: 'Agriculture has to do with the production of crops and stock, and a course of biology mainly dealing with plant life, together with such a thorough course of chemistry and physics, as is necessary thereto, constitutes the fundamental science.'

THE EMPLOYMENT OF THE SCHOOL GARDEN,

and of visits to experiment stations and estates where work with a definite agricultural object may be seen in progress is of special importance in this stage. This is well expressed in the Memorandum, as giving the science intruction an agricultural bias; and it is pointed out that this bias does not in any way depreciate the value of the science instruction to those who do not intend to take up agricultural occupation ultimately; on the contrary, a subject which is brought into touch with environment tends to become real and living and more easily mastered. The matter is seen to be important, then, with respect to general education, whether agriculture or other subjects are to receive attention when the pupil leaves school.

FARM SCHOOLS.

In dealing with the subject with reference to England, the matter is considered further in connexion with farm schools. Institutions of this nature have not been adopted to any extent in the West Indies, except in Jamaica and British Guiana. Their place is taken to a degree by the Cadet System that is in operation at several of the Botanic and Experiment Stations, and by the Courses of Reading instituted on the part of the Imperial Department of Agriculture. In England experience of the existing farm schools shows that the work should be very practical in character. The time expended on a short course does not allow the

teaching of the principles of chemistry, for example, to those who are unfamiliar with this subject; whereas there is no need for this teaching in the case of those who already possess a knowledge. This does not prevent it from being true that the method of education should be thoroughly scientific—

THAT EXPERIMENT SHOULD FORM THE BASIS FOR INSTRUCTION,

and that nothing should be taken for granted. It will be evident, in any case, that the proper correlation of the educational work in the secondary schools with that if institutions of a higher order will give such instruction in the elements of useful science subjects as is necessary will greatly simplify the work of the higher course.

Matters of this kind have not reached such a stage, in the West Indies, that attention can be given in a brief and general way to the subject of the provision of agricultural colleges. Sufficient has been said to show that experience in education, that is of a more directly agricultural nature, in this part of the world, has resembled in many ways that which has been met with in other countries; and that the West Indies have been saved some of the delay that would be caused while knowledge was being gained in order to rectify those mistakes. —(*Agricultural News,*)

TUSSORE SILK INDUSTRY IN THE DECCAN.

The Tussore Silk Cocoons are as a rule brought from the jungles by the Kolies (a sect of wild tribe) and sold to Koshtees (a sect of Hindoos who reside in remote villages). The price varies from Rs 2 to Rs. 4 per 1000. It is generally the Koshtees women who reel the silk from the entire cocoons.

REELING IS DONE AS FOLLOWS:—

100 cocoons are put in a pot and boiled in water mixed with a small quantity of soure (probably an alkaline deposit obtained in winter when the floods in the rivers have subsided). Besides soure a small quantity of the ashes of gingelly plant, til, obtained by burning dried stalks, is also added. The quantity of water, ashes and soure for 100 cocoons is adjusted by experience as is the time for boiling. The Koshtees engaged in this industry have been engaged in it for generations. When the cocoons are

SUFFICIENTLY BOILED

they remain separate from each other; on touching with the finger and thumb the coarse network is easily peeled off and 6 to 10 of them are kept in a flat dish wrapped up in a woollen cloth (wet) and put in another flat dish containing a wet woollen cloth, by the side of a woman holding the middle bar of a wooden frame by the left hand, with her index finger resting against a projection of the middle bar. The frame is oblong, about 6″ by 3½″"; the upper and lower bars and the connecting middle bar are made of wood, the side ones are of strings shaped thus

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With the hand dipped in water the ends of all the threads are united and by a peculiar movement of the left hand, these combined threads are twisted as a single thread on to the top bar of the frame as a figure of 8. The two loops of the figure are around the two side strings of the frame thus ∞. By constant practice

A WOMAN BECOMES SO ADEPT

that directly the threads break, she picks them up with the index finger and thumb of the right hand and unites them on the bared thigh (right) with the palm which is wetted. When the thread of one is finished and the boiled pupa exposed, another is picked up from the boiled stock and the process is repeated. By experience of generations the operation seems almost mechanical.

The old woman I watched reeling was practically blind. This reeled silk, after being dried in the sun, is sold to another sect of

HINDOOS KNOWN AS KHUTRIES,

who weave it into cloth. Sometimes this silk is dyed red with a vegetable dye (Patung wood) or yellow with a de-

1489 and serving 44,000 acres (as against coction of Tasoo (*Butea frondosa*) flowers with the addition of a little lime. Both are found commonly in the jungles here. Other colours are used but they are aniline dyes. The weavers say that the vegetable colours do not decrease the strength of the fibre and the dyes are fast. The Tussore silk cocoons, which are small in size and poor in quality, are reared by the Kolees on Chininghee (*Lagerstrœmia parviflora*) and Muddhee (*Ficus racemosa*) trees which grow in large numbers in adjoining hills.

AHMED MIRZA, M.D. B.Sc.

PADDY CULTIVATION.

By E. Elliott.

THE NORTH-CENTRAL PROVINCE.

Nuwera Kalawiya.

In Nuwera Kalawiya the principal division, the extent of land included in Turnour's commutation in 1831-2, was 5176 amunams, and he anticipated half would be cultivated in each year and yield a crop of 140,000 bushels the Government share of which would yield £368 with paddy at 5*d*. per parah (=6·66*d* per bus.) The usual amount of seed sown per acre in this district is reported (S.P. VI. of 1908) to be 2½ to 2¾ bus. so that the above number of amunams is equivalent to about 12,000 acres; and there must have been a considerable proportion of this regularly cultivated in the thirties, for though provision was made for exemption in case of failure, the commutation collection was in excess of Turnour's estimate.

In 1866, the Irrigation Committee was informed that the crop in Nuwera Kelawiya varied from 3000 bus. to 68,000 bus. but that the total area of paddy land was 173,683 bus. sowing extent, say 70,000 acres. This of course included a very large amount of long abandoned land, and the extent actually cultivated in the sixties was approximately between 4000 and 45,000 acres and the production 90,100,000 bushels, which had increased to 7,000 and 17,600 by 1872-6.

In Tamankaduwa

the average crop 1830-3 was estimated at 8000 bushels, and in the sixties it had risen to 23,000 bushels and continued at about this figure till 1890.

THE FOREGOING ESTIMATES FOR BOTH DISTRICTS

are based on sums received for the Government share; for though the Province was constituted in 1871, the usual agricultural estimates were not published in the Blue Book till 1876, when the area sown for the entire Province was reported to have been 23,000 acres and the crop 257,000 bushels, the climatic conditions having been favourable (rainfall 92, S.W. V.H. and N.E. G.) The next ten years were occupied in the work of restoration, and production rose to an average of 470,000 bushels in 1888-92, the last crops liable to tax. This period included two very large cultivations in 1891 and 1892 reported to average 40,000 acres, producing over a million bushels of paddy. Of the correctness of these figures there seems no doubt as Mr. Ievers states they are the headmen's estimates which he was inclined to think rather low, and explains that this superabundance was due to exceedingly favourable climate conditions and the additional capacity for storage of the rainfall by the extensive restoration of tanks, great and small. There was another record crop in 1899, of 1·2 million bushels of paddy off 25,000 acres, raising the average of the period (1898-1902) to 628,000 bus.; while for 1903-7, the average is 39,000 acres and 670,000 bus. though the rainfall has been limited and adversely affected cultivation in other parts.

Irrigation Storage.

In this connection it is important to emphasize that none of the streams in the Province rise in the wet zone of the island and that consequently these very favourable results have been attained by providing for the effective storage of a limited rainfall averaging only 54 inches, especially by the restoration of the old village tanks, reported to number

21,000 in 1877) and most of which is cultivated once a year; besides 7400 under the larger works, off which two crops a year are taken.

On Irrigation the expenditure to the end of 1906 (exclusive of that in the uncompleted Nachakaduwa scheme but inclusive of the outlay by Government on village tanks) was Rs. 1,609,000 on construction and Rs. 300,000 on maintenance.

The recoupments are Rs. 8,379 in rates, Rs. 99,977 repayments and Rs. 97,500 by sale of the land benefitted; making a total of Rs. 205,856. But to this should be added the additional recoveries due to irrigation on account of the government share of the crops up to abolition in 1892, which was about Rs.175,000 more. I calculate that if now in force this would secure to Government a return of 3 % on the total outlay and have reduced the outstanding cost by a million rupees.

EASTERN PROVINCE.

IN BATTICALOA.

The extent of paddy land in private hands early in the fifties was about 20,000 acres, and in consequence of the construction of some irrigation works during Sir H. Ward's regime and the energetic administration of Woodford Buck, there was an increase to 41,000 in 1866, while the areas cultivated (1862-6) averaged 39,000 acres producing a crop of 541,000 bushels.

By 1874 the extent had increased to 60.000 acres but this was inclusive of the old land, which was gradually going out of cultivation, and the acreage actually sown during 1867-71 averaged 51,000 acres and the production over a million bushels. During the next period (1872-7) cultivation still further rose to 54,000 acres, but owing to less favourable climatic conditions the crop fell a little to 810,000 bus. As this supply was in excess of local requirements, a considerable quantity (200,000 bus. in 1876) was exported coastwise to Jaffna, besides a quantity converted into rice and supplied to the Uva estates by the Moor traders, of which no estimate is available, but I was assured that for this purpose a large local importer of Indian rice employed at one time over 200 women a day.

INCREASED PRODUCTION AND HIGH PRICE.

Consequent on this increased production and the high price ruling for rice, owing to the scarcity in India, a great increase of prosperity prevailed in Batticaloa; a large extent of Crown land was purchased for extension which raised the area of paddy land in private hands to 75,700 acres in 1877 inclusive of the old land.

In the next year, heavy floods did such damage to a large cultivation (50,000 acres), that the resulting crop was only 494,000 bus. and the drought which followed in 1879 further restricted operations practically to the irrigated area, 28,000 acres. but even then the crop was a poor one (235,000 bus.)

It took some time for the district to recover from the effects of two such calamitous years, and in 1886 the Grain Commissioner found the area liable to tax was 65,773, but this reduction, on the previous commutation of 10,000, was due to the exemption of the old unproductive unirrigated land, no longer liable and also exclusive of new land, aswedumized within the previous seven years.

IRRIGATION FACILITIES SHORT OF REQUIREMENTS.

It was recognised too that cultivation had exceeded the capacity of the irrigation works, so provision for additional storage was undertaken, but the beneficial effect of these measures were not apparent until the 1893-7 period when the crop was 1·2 million bushels off 65,000 acres.

To this large area there were considerable additions, as the area cultivated in 1900 is said to have reached 91,000 acres and to have averaged 75,000 acres during the 10 years previous to 1907.

As the total extent benefited by the irrigation works was in 1906 but 47,300, it follows that a large extent is again dependent on the local rainfall and

climatic conditions which during the recent years have not been favourable, as recorded by Mr. Freeman in his report of 1908 S.P. VI. viz:—"In 1912 everything was swept away by flood and thereafter there were seasons of drought; in March 1907 the cyclone damaged a promising crop and the N. E. monsoon was a failure with the consequence that there is less than a half munmari crop" (for 1908).

Notwithstanding these unfavourable influences, I find that the crops from 1898 to 1907 averaged over 1·1 million bushel of paddy and were only once very short (470,000 bus. in 1906,) but even then no less than 69,000 acres had been sown owing to seasonable rain in November 1905, but the long continued drought which followed adversely affected the crop.

THE IMMENSE DEVELOPMENT

of the district during the past 50 years, and especially the very great extension of paddy cultivation refute both the pessimistic views expressed by Mr. Freeman in this report and his reflections on the "habits of the people," especially the Moors who form such a large proportion of the population, who have in spite of unfavourable seasons, so to say, returned to the charge and persisted in cultivating considerable areas though frequently receiving incommensurate recompense for their labours.

It is interesting to note that the best crops in Batticaloa are now not secured in the years when the rainfall is heaviest, but when it is moderate. Additional storage is, therefore, the remedy required to meet this great extension of cultivation and the two

LARGE TANKS AT UNICHE AND KONDAVETLAVAN

(completed since 1906) have doubtless proved as successful as the older works. But they by no means are all that is wanted to keep pace with further development of the industry, or justified by the financial success which has attended the outlay in the past, which I will now proceed to discuss.

On *Irrigation* the total expenditure to end of 1906 (exclusive of the two incompleted works above mentioned) was Rs. 1,255,149 on construction and Rs. 439,328 on maintenance, making a total of Rs. 1,649,477.

On the other side of the account there has been actually realised, by rates Rs. 53,899, by repayments (of original cost) Rs. 234,935 and by sale of land benefitted Rs. 621,034, making a total of Rs. 909,868. But this does not represent all the return to Government; and to it must be added the additional revenue for its share of the increased crops up to 1892. Allowing 25 % (for subsequent rise in the price of paddy) on the average given revenue (Rs. 24,000) of the pre-irrigation period (1856-9) I find that over and above this, the increase between 1860 and 1892 amounts to Rs. 895,000 in round numbers.

This added to the recoupments above specified, makes a total return of say Rs. 1·805,000 against a total expenditure (including maintenance) of Rs. 1·695,000.

In other words the Batticaloa works had up to 1906 rather more than entirely repaid all expenditure in regard thereto—so that Sir John Keane was quite wrong when he wrote the "only blemish in the record of progress in the Eastern Province is a disregard of financial considerations which has occasioned an annual charge upon revenue for the maintenance of an industry capable of its self-support."

IN TRINCOMALIE

the average area cultivated in the 1862-6 period was 5,000 acres producing a crop of 50,000 bushels. In 1869, the restoration of Allai and Kanthalai tanks was begun and there has been steady but slow advance ever since, reaching an average of 10,000 acres producing a crop of 330,000 bushels during the 10 years ending in 1908.

The area included in the G. C. registers in 1880 was 7814 acres and it is reported by the Asst. Agent (S. P. VI of 1908) to have increased to 11,428 in 1907 composed as follows: Irrigated by large works 6,870; by 43 restored village tanks 1,555

and 4,000 Munmari deficient in rainfall. Of this increase in the 20 years 1,000 acres were under Kanthalai.

On *Irrigation* the outlay (to end of 1906) was Rs. 603,581 on construction and Rs. 126,476 on maintenance.

The recoupments are Rs. 10,042 in rates Rs. 58,411 (repayments of original cost) and Rs. 66 062 by sale of the lands benefitted. Here too there was a furtheir return to Government by the increased tythe, but I have not materials to estimate it.

THE NORTHERN PROVINCE

is one where the least progress and development have taken place in paddy cultivation. Between 1862 and 1882 the average production was 627,000 bus. off 59,000 acres; but owing to favourable climatic conditions rose in the period 1883-7 to 771,000 off 61,000 acres.

THE JAFFNA PENINSULA.

Here paddy is only one of the several crops, by which the industrious cultivators turn the soil to account and production varies accordingly. On the mainland portion of the district there is a large extent of suitable land but the cultivation is limited and precarious and the population is small. A large work for the benefit of the Karachchi, the necessity for which was long recognised, has been undertaken, but I regret to notice that, in view of the very heavy cost, Government contemplate charging a water rate of Rs. 4 per acre on the Crown land adjoining the tank and not yet alienated (apparently in addition to the selling price) and to leave out of consideration, for the present, the old fields, as the owners declined to any advance on the Rs. 2 originally contemplated.

THE VAVUNIA DISTRICT

was created in 1878 and there was a transfer to it from Mannar of the 5 Vanni Pattus, with a population of nearly 5,500 and 2,000 acres of paddy fields. It was however shortly after practically amalgamated with Mullaitivu.

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This combined district, formerly known as the Vanni, was celebrated in olden times for the large area cultivated with paddy, which it is reported extended to over 11,000 acres in the times of Vannias and under the Dutch, but fell after the British occupation to 3,400 acres in 1807. "The system of utilising the water (required for such a large extent) was remarkably perfect," writes Mr. Lewis, and the number of tanks over 700, which were practically uncared for, until the introduction of the Paddy cultivation ordinance and then repair was systematically taken in hand in 1880. In 1886-8 six of the larger tanks were restored by Government, and 150 tanks, on which the cultivation had completed the necessary earth work, were provided in 1890-1 with Murray sluices. In the latter year a bigger tank known as Kanuakeni was taken in hand by the Central Irrigation Board and, though there was much delay in providing the necessary channels, the Asst. Agent reports (1908) it has been a great success, almost all the irrigated land sold and yielding harvests *twice* in each year over about 1,000 acres.

Under these favourable circumstances the crops and area have increased from 68,000 bus. off 8,000 acres in 1878-82 to 151,000 bus. off 11,000 acres in 1903-07.

IN THE MANNAR DISTRICT

though the soil bears a high character for fertility, the climatic conditions are as a rule unfavourable, the rainfall averaging only 38"; about 60 per cent. of which is received in the N. E. monsoon. The population, too, is limited and over two-thirds of it resides in the island and is largely engaged in fishing and interested in palmyra groves.

In 1875 the Irrigation ordinance was introduced, and owing to action taken thereunder, and the more favourable seasons, the average crop reached 101,000 bus. off 7,000 acres in 1888-92.

When Asst. Agent of the district in 1875 the writer urged the restoration of the Giant's Tank, but the first estimate by Mr. Parker in 1881 was over a million rupees for the irrigation of 25,000 acres. To meet limitations imposed

by the Legislative Council this was cut down to Rs. 282,400 for the irrigation of 15,000 acres, which was sanctioned in 1894. The supply channel was sufficiently completed by November 1906 to turn the water through the breaches in the old bund to the fields and the restoration of the tank was completed in 1904 at a cost of Rs. 609,648 and reported to be capable of irrigating 23,000 acres including 7100 of old land. But to do this further provision had to be made for the improved channels of distribution, regarding the cost of which there appears to have been difference of opinion and pending their completion the resulting benefits have been limited.

In 1907 the acreage cultivated under the tank was 8200, and as the rainfall (46″) was above the average; the total acreage under paddy in the district rose to 11,000 and produced a crop of 150,000 bushels of paddy. Notwithstanding the large addition to the original cost found necessary—as there is another 15,000 acres capable of cultivation—the pecuniary prospects of this scheme appear to be most encouraging, and it should eventually make a return of 5 % if not 6 % on the net cost of construction after allowing for the recoupments from the sale of the land.

IRRIGATION IN THE NORTHERN PROVINCE.

On irrigation in the Northern Province, excluding the outlay on the Giant's Tank and Karachchi schemes, the expenditure has been Rs. 442,534 on construction and Rs. 89,934 on maintenance. This includes Rs. 106,522 on sluicing the 427 village tanks repaired by the cultivator and irrigating 12,443 acres, largely in the Mullelawe district. The recoupments have been up to end of 1906 (exclusive of the Giant's Tank) Rs. 15,878 from sale of lands and Rs. 16,469 by rates.

It must be borne in mind that the expenditure in this Province was undertaken, as in the adjacent N. C. P., to rescue a dwindling population from distress and disease. This is apparently still the case in the Mannar district where the Asst. Agent reports "the population is constantly decreasing; the total number of deaths exceeded the births by 1669 in the last five years, an appalling state of affairs," which it is to be hoped the increased supply of food and water provided by the restoration of the Giant's Tank may largely remedy.

Under the circumstances it is to be hoped that the proposed channel from the Tekam to the Akathi Miruppu tank on the Southern Bank, which was begun in 1904, but stopped, may be taken up at an early date as it will serve a large extent of land held by Moormen, who are industrious and energetic, and will undoubtedly justify the necessary expenditure in a very short time.

THE NORTH-WESTERN PROVINCE.

KURUNEGALA DISTRICT.

Regarding the Kurunegala district, it was reported in 1867 that the extent of paddy land had decreased from 400,000 acres to one-fourth of this, but the average area actually cultivated was then only 52,000 acres, producing a crop of 800,000 bushels of paddy. There was only a slight increase in these figures till 1878, when owing to the heavy rainfall (114″) the extent cultivated doubled and the crop was estimated at 2½ million bushels of paddy, and it was even a little above this in 1879 (when the rainfall was 157″). These figures show what the district was capable of producing under favourable climatic conditions. Progress, however, continued, and only in four years when the rainfall was very deficient were the crops under 1 million bushels of paddy, and since 1903 they have been over 2 million bushels of paddy, a result ascribed to the irrigation works executed in the district, especially to the very extensive repair by the cultivators of village tanks. The number of these is stated by the Director of Irrigation in his report for 1907 to be 1,116, benefiting 85,392 acres; but the value of the labour contributed by the landowners is not stated nor the amount of the Government contribution, which, however, was

not large as the sluices provided were of the cement pipe description.

On Irrigation, by the larger works, the outlay on construction was Rs. 839,715 benefitting 7,271 acres (exclusive of the area under village tanks stated above). On maintenance (to end of 1906) a further sum of Rs. 134,857 was expended and against that there has been recouped Rs. 82,287 by rates and Rs 12,745 by land sales, Of the expenditure on construction Rs 628,532 was on the Deduru-oya works, already irrigating 4,300 acres and capable of serving a further 5,700 acres, all lying in a part of the district which has been sadly tried in the past.

That the general condition of the long neglected Seven Korales has been immensely ameliorated by this expenditure and policy, with which the name of Frank Fisher must be associated, goes without saying. Evidence of the coming prosperity is supplied by the fact seconded by Mr. Saxton that the villagers round Maho station sent away during 1907 by rail, 412 tons of rice, (the equivalent of over 30,000 bushels of rice,) the more especially as this was done in a year when the rainfall was abnormally low (66″).

IN PUTTALAM AND CHILAW DISTRICTS, it was estimated in 1866 that the sowing extent of paddy land was 100,000 bushels, equivalent to about 40,000 acres, but this was inclusive of a very large extent of old abandoned land lying in the Puttalam division where the rainfall is very limited (averaging only 38″) and the population small (28,000) chiefly resident on the sea coast and interested in coconuts. In Chilaw the rainfall is somewhat better (55″) and the population much higher (75,000); also largely resident close to the sea coast where the soil is more suitable for coconuts.

There has, however, been progress in paddy cultivation which has risen from an average of 4,000 acres in 1882-4 to 12,000 in 1903-7, and production from 94,000 to 194,000, of which only one-third was contributed by Puttalam.

On Irrigation, a sum of Rs. 241,788 has been expended on construction and surveys, and Rs. 178,683 on maintenance, of which Rs. 138,321 has been recovered by rates, repayment and land sales. Village tanks in this district are, it is reported, receiving attention, the restoration of 135 benefitting 7,873 acres in the Chilaw and 122 watering 3,350 acres in Puttalam, having been undertaken.

SOUTHERN PROVINCE.

In *Galle* district according to Schneider, early in the last Century the area of paddy land was 32,500 acres calculated to yield 216,000 bushels. In 1866, the area was reported to be 31,500, of which 28,000 were on an average cultivated and yielded 269,000 bushels. In 1880 the Grain Commissioners' enquiries fixed the extent at 45,461 acres, and the average cultivation had risen to 43,000 acres, yielding 500,000 bushels.

The average production for 1903-7 was 597,000 bushels, but a crop of 725,000 is reported in 1908-9—years in which the N. E. monsoon was good and the lightness of the S. W. was probably favourable to the extensive lowlying lands on the banks of the Ginganga, which takes its rise in the very wet zone.

THE DEVITURE DAM.

The rainfall in all parts of the district being, as a rule ample, no storage of water is required in the interests of paddy and the expenditure classed as irrigation has been on works for protection against flood and on facilities for drainage. One of these executed in Sir H. Ward's regime at a cost of Rs. 66,000 proved a failure for, though it kept out the floods in the Ginganga from a large tract of fields in Deviture, no provision was made for the drainage of the local rainfall which is considerable. It has consequently been abandoned as the cost of construction of the necessary outlet would be utterly disproportionate to the benefit to be secured.

DEDDUWA SCHEME.

In the Dedduva scheme for guarding against the incursions of the floods of the Bentota river, due provision was made for drainage; it has proved successful and, though costing a gooddeal more

than originally estimated, has ensured the regular cultivation of over 3,000 acres.

On Irrigation the total outlay has been for maintenance Rs.24,240 and Rs. 132,637 on construction but, deducting the outlay on the Deviture Dam under both heads, the balance is Rs. 56,637 for construction and Rs. 15,378 for maintenance, making a total of Rs. 82,015 of which Rs. 20,479 have been recouped by rates and repayments.

MATARA DIVISION.

In Matara district, Schneider's estimate was 35,526 acres early in the last century, and there was no advance in this up to 1866, when the total area of the paddy land was reputed at 36,000 acres; but by 1883 it had risen to 46,000 acres, which was the extent found to be then liable to compulsory commutation. The Western half of the district is well watered, but in the easterly parts the rainfall is more limited and these suffered severely from the drought which prevailed in 1865-6, while the water supply of the Gangaboda Pattu had been adversely affected by the construction of the Kirema dam in Sir H. Ward's time.

SIR HERCULES ROBINSON'S TERMS

were, as already mentioned, readily accepted and a large expenditure on irrigation was incurred. Consequent on this production doubled at once rising from an average of 358,000 bus. in 1867-71 to 748,000 in 1872-6. The crop is reported as having been 1·1 minion bushels of paddy in 1894, when the climatic conditions were very favourable. The average for the twenty-five years (1877-1902) was over 700,000, and only 10 % less during the next seven years of short rainfall.

On Irrigation Rs. 559,222 was expended on construction of works benefitting just 7,000 acres. This extent is liable to a rate of Re. 1 per acre in perpetuity which had (to end of 1906) brought in Rs. 190,492 and land sales Rs. 1,524, while the maintenance cost Rs. 111,405, leaving Rs. 80,611 to go in reduction of the capital outlay.

As a good deal of the area irrigated was not previously cultivated even once annually, and as it all subsequently yielded two crops a year, the increase in the government share thereof (prior to abolition of the grain tax) may be put at three bushels per acre worth Rs. 1·27 per bushel (the average rate at which the rents sold subsequent to 1874). The money value of this contribution for the eighteen years it existed (1874-92) comes on the foregoing data to Rs. 490,000 which, added to the above surplus of the water rate, say Rs. 80,000, makes a total recoupment of Rs. 560,000 against a capital expenditure of under Rs. 560,000. Or in other words the Matara works have paid for themselves, and Government is now receiving an annual revenue of, say, Rs. 3,000 from the lands in excess of the cost of maintenance.

HAMBANTOTA DISTRICT.

In Hambantota district Schneider's estimate was 29,000 acres in the Giruwa Pattu alone, of which about one-third was benefitted by the Urubokka Dam until it burst in 1837.

The construction of the Kirema Dam in 1828 doubtless added to the extent regularly cultivated until it also was destroyed in 1837.

In 1866, the aswedumized area was reported to be 18,500 inclusive of a small area in the Magam Pattu, and in 1885 the Grain Commissioner's registers totalled 20,118.

Though the two dams above referred to were restored in Sir H. Ward's regime, as they simply turned the water of a wetter zone the benefit which accrued was limited and the Giruwa Pattu suffered very severely during the drought of 1866 and 1877.

This led eventually to the provision of storage, especially the construction of the Udukirivile Tank, but there was no material advance in production till 1886. Further provision both for storage and distribution on both streams in Giruwa Pattu West is required, but the unwillingness of the land owners to accept the Government terms prevented the execution of several suitable proposals.

Faute de mieux it is gratifying to learn that the cultivators have in recent years done earth work on 144 village tanks irrigating 2,455 acres.

In Giruwa Pattu East a beginning was made with the Walawé scheme in 1886, but it took over ten years to perfectly complete the works which are now reported to irrigate over 5,000 acres, about one-seventh of which was opened under the writer's personal supervision.

MAGAM PATTU.

In Magam Pattu, though a beginning was made so far back as 1871 on the restoration of Tissawewa, when the writer visited the village as Grain Commissioner in 1884, the area under paddy was only 240 acres and subsequent development was slow, but encouraging under the favourable conditions then prevailing, viz., cheap land and no water rate. This latter concession continued until 1894, since which a maintenance rate has been levied on land purchased prior to that year and a rate of Re. 1 per acre on any subsequently acquired. Under these conditions the cultivated area increased to 5,103 acres by 1906, and this has necessitated a large additional outlay on works, amounting altogether to Rs. 340,110 to end of 1906, but of this Rs. 119,000 has been recouped by the sale of the land benefitted.

PRODUCTION.

Under the circumstances detailed above the increase in production in the district as a whole was slow until 1888-92 when it reached 277,000 B. P., since which however it has risen rapidly up to 841,000 bushels in 1903-7, with a maximum of 996,000 in 1905. To these later figures the Tissa lands have contributed very largely according to the Assistant Agent's report, viz., 480,076 bushels off 4,319 acres in 1905 and 530,780 bushels off 5,928 acres in 1907. Apparently these are not bureaucratic estimates, but the usual and ordinary headmen's returns, and the area stated was probably twice cultivated within the year but only once enumerated, while the crops are of course the aggregate of both harvests. If this conjecture is correct the yield was 22 bushels per acre, but under any circumstances 44 bushels per acre is by no means an improbable return, as the land is known to be very fertile and a good deal of it new. The weather conditions appear from the same report to have been favourable in the Magam Pattu, though very adverse in Giruwa Pattu East, where the crops in the above years have consequently failed to a very large extent.

On *Irrigation* in the Hambantota district the total outlay (inclusive of that in Sir H. Ward's regime) is Rs. 1,135,378 and the extent benefitted 29,407 acres. Of the land sold in the early sixties under Kirema and Urubokka there is no record; but it was I am aware considerable and probably equalled the original outlay on both works (Rs. 86,000), so this amount may be struck off both sides of the account. The subsequent sales have brought in Rs 193,000 and rates recovered amount to Rs 170,024 as against Rs 135,144 expended on maintenance. So that the outstanding balance at end of 1906 was about Rs. 922,000 and represented the nett cost of the works in this district.

In this connection it is interesting to note that one-tenth share of the average Tissa crops for 1905-7 at Re. 1 per bushel amounted to 20 % on the nett outlay on the works.

YELLOW TOBACCO AND TURKISH TOBACCO.

NOTES ON CULTIVATION.

The following notes on the growing of Yellow Tobacco are furnished by Mr. C. J. Monson in the *Agricultural Journal of British East Africa* :—

The main requirement is a light, well-drained soil; even a comparatively poor sand is to be preferred to a heavy soil. Next the situation should be protected from wind and the land clean and well worked.

The varieties best suited for yellow tobacco are Hester, Goldfinder and Yellow Orinoco.

Cloth shade for the nursery beds has given excellent results. These beds are conveniently made 3 to 4 ft. wide.

Sowing must not be too thick; one heaped tablespoon of seed to 100 sq. yards of bed will serve 6 or 7 acres. It is better, however, to allow a good margin and to have a succession of beds. It is best to sow 6 or 7 weeks before rain is expected and sow weekly till considered enough.

Harden the plants by gradually reducing watering and shade about a fortnight before transplanting. Planting is done 3 × 3 ft. If the plants incline to become stunted, apply liquid manure. If flies or worms appear, spray with a mixture of 1 lb. Paris green, 4 or 5 lbs. lime to 100 or 150 gallons water. For cut-worms sprinkle bed with lime and water to wash lime off plants, or make a trap of 1 lb. Paris green to twenty flour or bran, or a mixture of arsenic and sugar. The surest way is to hand-pick the worms.

Tapping and Harvesting.

Topping must be done just before flowering, and the resulting suckers removed. An average of ten leaves is allowed to develope. Ripening begins about a fortnight after topping. Better gather slightly overripe than green. Gather in the morning and only take the ripe leaves, avoiding a wet day.

After tying the leaves to sticks they are removed to the flue-barn. The following is a description of a

FLUE-BARN :—

Internal dimensions 16 × 16 ft., height 8 ft. to wall plate. From the furnace outside a flue pipe of thin stove piping is carried round the interior through the wall and up above the roof.

The internal space is divided into tiers 2 ft. apart vertically, and 4 ft. centre to centre by means of rails built into the wall ends giving four rooms. The rails are supported by uprights at intervals of 4 ft.

Two inlet ventilators near the ground and exit ventilator in each gate should be provided.

The sticks with the leaves are suspended on the rails, the top tier being first filled. Filling should be done quickly and on the day of reaping.

A slight fermentation by means of heat is thus started and the leaf yellows. Then the temperature is raised to drive out moisture and fix the colour.

Treatment.

The following is a description of the treatment which has been satisfactory in Rhodesia :—

As soon as the barn is filled, close the ventilators, raise the temperature of the barn by means of a small fire to 85° F., and keep at this through the night; next morning raise the temperature 1° per hour till 90° F is reached; should the weather be dry some water may be sprinkled on the floor of the barn at this stage. The temperature is maintained at 90° F. till the leaf changes to a bright greenish yellow, when the heat is increased 2° per hour till 105° F. is reached. The ventilators are then slightly opened, the increase of heat 2° per hour is continued till 115° F. is reached, by which time the ventilators having been gradually opened are at widest extent. The temperature is now increased two or three degrees an hour till 125° F. is reached; that heat is maintained till the leaf is dry, when the temperature is again raised this time 5° an hour up to 160° F. at which it is held till the mid-ribs are dry.

The fire is then drawn and the tobacco allowed to cool off and take up sufficient moisture to allow of being stripped from the sticks.

When the leaf is quite soft, but the mid-rib near the butt brittle, the leaf is in a condition to be handled. It is stripped from the sticks, care being taken that all midribs are thoroughly dried out as these, if wet, will start mould. The tobacco is then put in bulks on a wood floor, the tails being inside and the butts out, the tobacco being piled up as high as can conveniently be done.

Maturing and Colouring.

It is then left to mature and colour for a couple of months or more, when, on

opening out the bulks, a great improvement will be noticed, especially as regards colour.

Should there be any danger of excess of moisture in the bulks they must be at once pulled to pieces and re-bulked.

The tobacco is now ready for grading and baling.

The same authority suggests that Turkish tobacco should be grown together with yellow leaf tobacco as in Rhodesia, since the two thrive in the same kind of soil. The seed is difficult to procure and should therefore not be wasted when got. A sowing of 1 oz. to 60 sq. yards is recommended, mixed with 12 oz. ashes. The object in cultivation is a small leaf, and hence close planting is adopted 6 or 8 inches in the rows which are put 2 ft. apart. The plants are not topped at any time, and 3 or 4 of the bottom or sand leaves are removed when they are about 18 inches high. In harvesting the lowest leaves are put together, and so also with the next in order up to the topmost. The method of withering and curing does not differ materially from the ordinary system in vogue.

CEYLON AGRICULTURAL SOCIETY.

ANNUAL MEETING HELD ON JULY 3RD, 1912, AT THE ALL-CEYLON EXHIBITION.

The annual meeting of the Ceylon Agricultural Society was held at the Agricultural Department Building at the All-Ceylon Exhibition on Wednesday, July 3rd, 1912, at 12 noon, His Excellency the Governor presiding.

There were also present :—Sir Hugh Clifford, K.C.M.G., Colonial Secretary; the Hon'ble Mr. Bernard Senior, the Hon'ble Sir S. C. Obeyesekere, Sir Solomon Dias Bandaranaike, the Hon'ble Messrs. J. G. Fraser, R. B. Hellings, H. VanCuylenburg, L. W. Booth, T. B. L. Moonemalle, Alex. Fairlie, P. Arunachalam, A. Kanagasabai, Wm. Dunuwille Disava, Messrs. R. N. Lyne, R. S. Templeton, Solomon Seneviratne, C. D. Vigors, E. E. Green, James Peiris, W. A. de Silva, F. L. Daniel, A. W. Beven, Tudor Rajapakse, L. W. A. de Soysa, J. H. Meedeniya, R. M., Henry A. Perera Mudaliyar, V. Casipillai, E. T. Hoole, H. F. Macmillan, Dr. R. H. Lock and Mr. C. Drieberg (Secretary). As Visitors :—Dr. Gerald H. de Saram, Messrs V. M. Muttukumaru, H. Charavanamuttu, Chas Taldena, and several others—the total numbering 80.

Minutes of the meeting held on June 20th, 1911, were read and confirmed.

The Auditor's Statement of Accounts for the year 1911 was duly passed.

The Secretary's Report for the year was adopted.

Mr. R. N. Lyne, Director of Agriculture, delivered an address on "Some Reflections on Rubber Culti ation and Agricultural Education," for which he was accorded a hearty vote of thanks proposed by His Excellency the President.

C. DRIEBERG,
Secretary C.A.S.

Colombo, 3rd July, 1912.

MOSAIC DISEASE OF TOBACCO.

The Director of Agriculture, Nyasaland, has issued a leaflet on this disease, which is prevalent in Ceylon, and is characterised by a peculiar marble appearance on the leaves.

In America the disease is variously called "frenching," "calico," "brindle" and "mongrel" disease.

The exact nature of the disease has long been a matter of doubt, but Dr. Woods, of the U.S.A. Department of Agriculture, gives his opinion, after careful investigation, that it is caused by "defective nutrition of the young dividing and rapidly-growing cells due to lack of elaborated nitrogenous reserve food, accompanied by an abnormal increase in activity of oxidising enzymes in the diseased cells."

There are various

CONTRIBUTORY CAUSES,

large-sized seedlings, which have a very vigorous growth before being transplanted, and those which have had their roots lacerated when being moved are most susceptible.

The disease may appear in the seed bed when it is too rich in nitrogenous manure.

It may also be

INDUCED BY ADVERSE CLIMATIC CONDITIONS,

such as prolongued drought. Such conditions interfere with the normal formation and distribution of certain elements which enter into the composition of the leaves.

For prevention or diminution of the disease, it is recommended that the seeds should be sown on fresh (virgin) soil or a burned seed bed. Avoid injury to roots in transplanting. Do not allow seedlings to become too vigorous before transplanting. If large and vigorous, balance root and top by taking off some of the leaves so as to favour quick development of the root system.

UNIVERSITY EDUCATION FOR THE TROPICS AND COLONIES.

Encouraged by the assistance of in fluential friends, we are steadily persevering with our efforts to keep the claims of the

TROPICS FOR AN AGRICULTURAL COLLEGE

before the powers that be on this side. This, of course, is no party question or political matter, and so no unofficial meeting that took place at the publishing offices of *Tropical Life* was confined to one side only, the idea being that each party, Liberal as well as Conservative, shall approach its leaders, and by securing support from both sides, assure success when the matter comes up for debate in the House of Commons.* Without going into details as to their politics, we need only say that honours were easy with the

FOLLOWING WHO ATTENDED

the meeting: Mr. J. C. Medd, a leading authority, and correspondent to *The Times Morning Post*, and other leading papers on agricultural matters; Sir Alexander Lawrence, of the Liberal Colonial Club, of which Sir West Ridgeway is Chairman and Lord Clenconner (formerly Sir Edward Tennant) and Mr. H. J. Tennant, M. P., active members; Mr. Samuel Simpson, who attended the West Indian Agricultural Conference, and is now *en route* for Uganda to take up the position of Director of Agriculture out there; Mr. William Fawcett, late head of the Agricultural Department, Jamaica, West Indies, and a member of the Council of the West India Committee; the Editor of *Tropical Life*—who is a member of the Liberal Colonial Club, the West India Committee, London Chamber of Commerce, the British West African Association, &c.; Mr. A. L. Hutchison, London representative of the *Times of Ceylon*, also, should have attended, but was unfortunately engaged; he has been supplied, however, with particulars of the meeting, which he has forwarded to Ceylon.

Those present discussed various schemes for bringing the matter before the present Government as soon as possible after the present rush of business has been eased off. Among the

PROPOSALS UNDER CONSIDERATION

for bringing this about, are (1) a dinner at which it is hoped one or more members of the Government will be present; (2) drawing-room, or other social meet-

* Arising out of this meeting we learn as we go to press, that arrangements will be made to hold a meeting in London to discuss the matter. At least one Member of Parliament has signified his readiness to call attention to the matter in the House of Commons, if supplied with the necessary details, and there is a possibility of others doing the same.

ings at which the subject can be discussed, and the importance of the movements and the advantages of such a college brought before the notice of those who might possibly become interested in the scheme.

ANOTHER MEETING

with somewhat of the same object, was held on April 26th, just a week before the *Tropical Life* gathering,* when Dr. A. E. Shipley, Master of Christ's College, Cambridge, read a paper before the Fellows of the Royal Colonial Institute and their friends on "Universities and Practical Education"; Dr. G. R. Parkin, LL.D., C.M.G., formerly Principal of Upper Canada College, but who since 1902 has been so prominently to the front as organizing representative of the Rhodes Scholarship Trust, occupying the chair.

Among the unusually large audience present were: Sir William Anson, M.P.; Sir W. Vaughan Morgan, Bart.; Prof. A. Smithells; Prof. H. B. Allen (Melbourne); Prof. Darnely Naylor; Mr. J. C. Medd; The Master of Downing College (Prof. Marsh); Prof. Robert Wallace (Edinburgh University), Mr. Samuel Simpson (Director of Agriculture, Uganda); Sir Godfrey Lagden, K.C.M.G.; Judge Roseby (New Hebrides) and the Editor of *Tropical Life*.

Prof. Allen (Melbourne) opened the discussion, other speakers including Prof. Robert Wallace, Prof. Marsh (Downing College), and the Chairman; a full report of the paper and discussion will appear in the *United Empire* (the journal of the R. C. I.).

Readers of *Tropical Life* will all agree with Dr. Shipley when he urged a more liberal study of geography, and that "those who aspire to seek their fortunes in Greater Britian should be given opportunity to study chemistry, geology, botany, forestry, agriculture and the like, to enable them to go forth qualified and tested, and adapatable to new circumstances and environments."

* Originally both meetings were to have been held on April 26th, the idea being to go on to the Royal Colonial Institute from our offices; Mr. Medd, however, had to go up North, so our meeting was postponed.

Here is the nucleus of our scheme, viz., for students to learn all they can over here and then go to a college overseas and

SPECIALIZE IN TROPICAL AGRICULTURE,

and it falls in with the lecturer's ideas. "For have we not to educate many boys and young men for life in the colonies and other countries?" continued Dr. Shipley. "It is the young man with the greatest power to compete with the developing methods of other countries who will be the most sought after by the busy man of commerce and industry. The young men whose minds have been broadened and sharpened by some *practical experience*,* who are adaptable to new conditions, are those who command the highest economic value." One of the main points advanced by our editor when giving evidence before the Departmental Committee appointed in 1907 or 1908, and presided over by Lord Reay, to inquire into and report upon the subject of agricultural education of this side, was the granting of travelling allowances to enable

THOSE STUDYING AGRICULTURE

with a view of settling in the Tropics or Colonies, whether as members of a Government Agricultural Department or as planters or estate managers, to become acquainted with methods in use at centres other than the one in which they already reside or are setting out for. Two other witnesses, Mr. William McCracken, formerly Professor of Agriculture at the Royal Agricultural College, Cirencestor, and Professor Winter, M.A., Professor of Agriculture at the University of North Wales, at Bangor, advocated a similar measure, which was accepted by the Committee and specially mentioned in their report, by "strongly urging that the Board of Agriculture should provide —as is done in other countries—scholarships enabling the holder to undertake post-graduate research, and also travel-

* Italics ours, thinking of the necessity for those wishing to become first-class planters and estate managers in the Tropics to obtain practical experience in an agricultural college on the spot.

ling fellowships to enable teachers and other suitable persons to study agriculture abroad." Thanks to the

ASSOCIATION FOR THE INTERNATIONAL INTERCHANGE OF STUDENTS,

the idea of travelling scholarships has become a fact, at least on an experimental basis, and it only remains now for the Government, or the public—better still the Government *and* the public—to subscribe liberally to a fund to (1) Found lectureships in tropical agriculture on this side; (2) to grant travelling scholarships for students and others attending such lectures, or institutions like Kew, the Imperial College of Science at South Kensington, &c., in direct touch with the Tropics; (3) and, most important of all, to establish a fund for erecting and endowing two

AGRICULTURAL COLLEGES IN THE TROPICS,

the first to be erected in Ceylon, the second in Trinidad, or elsewhere in the West Indies.

"It must be borne in mind that money for educational purposes is always difficult to obtain," Dr. Shipley went on to say, "and this difficulty is increased by the crying need of existing institutions."

This is a truism that ought not to be. Let us hope that with many other grievances and hardships that modern legislation has improved out of existence, such a cry will also become a thing of the past. A nation, the same as family, that cannot—worse still, that will not—give money to set up its young folks and give them (especially the deserving ones) a start in life does not deserve to prosper, and will not do so permanently. England, therfore, must not allow it to be said that her children cried out for an Imperial Education and were refused on account of the cost.—*Tropical Life*, May, 1912.

THE PROBLEM OF INCREASED PRICES.

The year 1911 witnessed a revolt on the part of consumers not only in America but on the continent due to the rise in the price of commodities.

With a view, if possible, to arrest the tendency of such a rise and suppress the cause, Prof. Bauer of Bale and Prof. Irving of Yale consider an international enquiry into the cost of living necessary, with a view, if possible, of counteracting those forces which tend to high prices.

It would appear that since 1895 there has been a general and steady rise in prices, and as a result there has been also an increase in the price of land, the rate of interest, rents of buildings, wages for labour, &c.

The search for the cause of this state of affairs is not only a difficult proceeding but yields the most conflicting results. If the question is put—what is the cause of the high prices in different countries?—we shall find that in the United States it will be attributed to trusts, in Germany to protection, in Paris and Vienna to the altered state of living, among agricultural labourers to weather conditions, among small traders to speculation, among stock-breeders to the middlemen, among small employers to strikes, among large contractors to the social laws, and so on.

Economists of great repute are inclined to attribute the rise in prices to the depreciation of gold as a result of its increased production—almost five-fold within the past 25 years.

Assuming that an international enquiry confirmed the opinion of the depreciation of the standard unit of value, what means would it give to those who desire to combat the reduction of the purchasing power of money? Mr. Irving Fischer proposes an international convention to render this purchasing power stable. The means by which this is to be effected, as proposed by Mr. Fischer, may not meet with general approval, and indeed it is only put forward as a suggestion; but there is practical unanimity as to the advisability of instituting an international enquiry into the whole matter—an enquiry which is bound to show certain fundamental deficiencies and defects in economic law which there is great hope of remedying by co-operation among the greatest statisticians of the day.—(Summarised from the *Bulletin of the Bureau of Economic and Social Intelligence*.

STAFF OF THE CEYLON AGRICULTURAL SOCIETY.

Reading from left to right, back row:—P. B. M. BANDARANAYAKE, A. MADANAYAKE, W. A. W. GUNAWARDANE, M. J. A. KARUNANAYAKE, N. M. JAYASURIYA. V. RAMANATHAN, L. A. D. SILVA.

CEYLON AGRICULTURAL SOCIETY:

Report for 1911-1912.

Meetings, Membership &c,

The previous Annual General Meeting of the Society was held on June 20, 1911.

During the year under review the following new members joined:—J. Littlejohn; H. O. Beven; G. S. Schneider; Stuart R. Cope; J. Brown; M. Valoopillai; N. D. Abeyagunawardene; H. S. Stevens; D. Fairweather; J. B. Dickie; J. Hedde; H. E. E Koch; E. A. Freeth; The Superintendent, Stckesland Group; John Tilly; E. H. Beling; Norman G. Westland; Henry Mason; E. S. Jorgenson; C. J. Owen; W. G. Bayley; W. Gibson; H. Woltersdorff; E. G. Adamaly & Co.; P. Alf. L Dias; Henry A. Perera; Camora Municipal, Margao; H. A. McMullin; Bosanquet & Co.; J. D. Finch Noyes; A. H. Taylor; J. Wells; S. P. Charles; C. S. Abayaratne; E. L. F. de Soysa; A. A. Ward; John X. Fernando; Major C. R. Hodgins; R. D. Scoble Hodgins; Superintendent, Capt. Garden, Akmimana; G. H. Hall; Volkart Bros.; C. A. Odiris de Silva; M. D. W. Roberts; Rosslyn Koch; Edgar L. Ephraums; K. Kantapodi; the Hon. Mr. P Ramanathan; the Hon. Mr. J. N. Tisseverasinghe; H. M. Drummond Hay; R. P. P. Weerasuriya; S. Weerakkody; E. Buultjens; St John Jonklaas; Ong Gyork Lin; A. J. Kellow; J. Homer Vanniasingham; A. E. Byrde; A. C. T. Meyer; D. L. Jayatilleka; H. W. Boyagoda, Ratemahatmaya; C. S. Braine; William R. Webster; J. F. Templer; T. Dell; T. B. Worthington; E. C. Shelton Storer; F. T. Coore; G. L. Smith; B. O. Dias; B. W. Bawa; Eastern and Pacific Trading Co.; G. B. Stuart; P. G. Wood; C. D. Waddilove; and the Hon. Mr. Anton Bertram. The total number up to date is 914.

Meetings of the Board were held on June 20, August 14, and October 16, 1911; January 8, March 8, and May 9, 1912. His Excellency the Governor presided at four meetings, the Hon. Sir Hugh Clifford at one, and the Hon. Mr. Booth at one.

The principal subjects that came up before the Board were: The All-Ceylon Exhibition; Pasture Land and Forage Plants; the Tobacco Industry; Experiments bearing on the Cultivation of Paddy; Fruits worth growing in Ceylon; Lac Culture; Indigo; and Chena Cultivation.

A financial statement drawn up by the Society's Auditors (Messrs. Ford, Rhodes & Church) is annexed to this report.

Publications.

The arrangement of the Society's English monthly publication has been slightly modified by the present Editor, with a view to making the reading matter more presentable.

The Sinhalese monthly ("Govikam Sangarawa"), edited by the Superintendent of School Gardens, with the assistance of Mr. N. Wickremaratne, is extending its popularity, and its circulation has increased to 2,350.

The Tamil edition of the magazine ("Kamat Tholil Velakkam") has been entrusted to Mr. S. Chelliah, whose experience stands him in good stead in undertaking this work.

The following is a list of the Society's leaflets issued free to members of the Society. The letters E., S., and T. indicate respectively that they are available in English, Sinhalese, and Tamil:—Agriculture in Tamil Districts (E.), Caterpillar Pest in Paddy Fields (E.), Castration of Cattle—Mode of Operation (E.), Canker (Nectria) of Para Rubber (*Hevea Brasiliensis*) (E.), Groundnuts (E., S., T.), A Note on Chili Cultivation (E., S., T.), Rules to Govern the Management of Agricultural Shows (E.), Yams (Dioscoreas) (E., S., T.), A Note on Onion Cultivation (E., S., T.),

Prevention of Plant Diseases by Spraying (E., S., T.), Cotton Experiment Station, North-Central Province, 1903 (E.), Castration of Cattle (Instruments and Dressing), (E., S., T.), Kiushu or Japanese Paddy (E., S., T.), On the Importance of submitting Specimens when reporting Injury from Insect Pests (E,, S.), Hints on Cotton Cultivation (E., S., T.), Useful Hints to Growers of Castor Oil (Eri) Silkworm (E., S., T.), Where Rubber will grow (E, S., T.), Agri-Horticultural Shows (Instructions for forwarding and arranging Exhibits) (E., S., T.), Shade Trees (Instructions for Planting &c.), (E., S., T.), Dumbara Tobacco (E., T.), Use of Salt for Manures (E., S., T.), Manioca Cultivation (E., S., T.), Dhall (its Cultivation) (E., S., T.), Method of taking Samples of Soil for Analysis (E., S., T.), Transplanting in Paddy Cultivation (E., S.), Bud Rot of the Coconut Palm (E.), The Improvement of Local Races of Plants (E., S., T.), A Simple Preventive against Malaria (E., S., T.), The Use and Object of Agricultural Societies (E.), West Indian Yams (E., S.), Castration of Cattle during 1906 (Annual Report) (E.), Report on a Visit to India (E.), Notes on a Tour in the Southern Province (E.), The Conservation of Soil Moisture (E., S.), T.), Rotation of Crops on Chena Lands (E., S., T.), The Stem Disease on Coconuts (E., S., T.), Diseases in Tobacco in Dumbara (S., T.), Results of Recent Experiments in Paddy Cultivation (E., S.), Arrowroot (E.), Further Notes on Transplanting and Manuring Paddy (E., S.), Rice Bug or Paddy Fly (E., S.), Nitrogen-gathering Crops (E., S.), Silk Cotton Tree (E., S.), Two Valuable Green Manures (E.), Rinderpest (G. V. S. Circular) (E.), Hints to Tobacco Growers (E., S., T.), Soy Bean (E.), Notes on Grafting and Budding (E.), Hints to Village Coconut Cultivators (S.),

STAFF.

At the end of last year Dr. J. C. Willis, on his retirement from the Government Service, relinquished his duties as Organizing Vice-President and Editor of the Society's Journal, since which Dr. R. H. Lock has conducted the publication.

The duties of the Secretary have carried him far afield, and in the course of his peregrinations he has practically traversed the whole Island, visiting not only centres of population, but penetrating into the interior of the Provinces.

The Society employs nine Instructors, of whom seven are engaged in the Sinhalese districts and two in the Tamil. These Instructors may be classified into groups thus:—

Group A.—Messrs. S. Chelliah, L. A. D. Silva, and N. Wickremaratne, who constitute the senior staff of officers, possessing, relatively to the order in which they are named, more extensive experience than the rest.

Messrs. Chelliah and Silva are trained students of the late School of Agriculture. The former, who is thoroughly conversant with the agriculture of the Tamil districts, is in charge of the Northern Province, with his headquarters at Jaffna, and also supervises the work of the Instructor stationed at Batticaloa. Mr. L. A. D. Silva is in charge of the Ratnapura District, with which he has made himself perfectly familiar.

Mr. N. Wickremaratne (like those who follow) had his training divided between the Government Experiment Stations and the Stock Garden. He (as well as Mr. Chelliah) has had the advantage of visiting some of the agricultural stations in South India, and also went through a "short course" at Pusa with special reference to lac cultivation.

Mr. Wickremaratne is in charge of the Southern Province, with his headquarters at Galle, and has supervised the work of the Instructor working in the Hambantota District. Previously he did good work in the Western Province, and also initiated a special scheme for the Kegalla District.

Group B.—This class comprises the officers who come next in respect of length of service, viz., Mr. W. Molegode, who is in charge of the Central Province and Uva, where, as a member of the Kandyan community, he has special opportunities for furthering the objects of the Society. Mr. N. M. Jayasuriya is stationed for a term in the Kegalla District, and is giving a good account of himself.

Group C.—Messrs. A. Madanayake, P. B. M. Bandaranayake, M. J. A. Karunanayake, and C. K. Sathasivam make up the junior staff of officers, who have hitherto been working under supervision.

Mr. Madanayake was recently sent to Kurunegala on probation, and is in charge of the Balalla garden; Mr. Bandaranayake has been stationed in the Hambantota District, giving particular attention to paddy work at Tissamaharama. Mr. Karunanayake has been in charge of the Society's seed store in Colombo, and has had to attend to the distribution of plants and seeds, while paying weekly visits to the Bandaragama garden.

The office staff is composed of a head clerk (Mr. J. S. de Silva), assistant clerk (Mr. W. A. W. Gunawardene), and two junior hands, whose special duties are as typists and registering clerks.

I should like to make special mention of the faithful services rendered by Mr. de Silva and his assistant, and express my appreciation of the substantial work done by the former from the inception of the Society.

Model and Experimental Gardens.

These gardens, which vary in size from two to fifteen acres, are carrying on work of a special character, according to the districts which they serve.

The Bandaragama garden, situated seven miles from Panadure, is in the main an orchard of oranges and other kinds of tropical fruit, including a large section under pineapples. A small extent is devoted to vegetables, and the Government circuit bungalow, which has been erected on the premises, stands on an ornamental plot of ground.

The Society, acting on the pound-for-pound principle, contributes to the maintenance fund a sum equal to that raised locally. The garden, which is directly under the supervision of Mr. J. A Wirasinghe, Mudaliyar of Rayigam Korale (whose interest in the improvement of his district is as genuine as it is sustained), was started by Mr. Conroy when Assistant Government Agent of Kalutara, and receives the warm support of his successor, Mr. Plant.

The Kegalla garden, situated in the town, receives similar aid. It was originally maintained by the Local Board, and its subsequent development begun during the time of Mr. Conroy, was effected by Mr. Wickremaratne, and is being kept up by Mr. Jayasuriya.

The Balalla garden, three miles from Maho railway station, has been worked under considerable disadvantages, situated as it is in a backward part of the North-Western Province, where labour is difficult to get and severe droughts prevail. The object with which it was started was to demonstrate the growing of dry-land crops according to a system of rotation outlined in the Society's leaflet No. 35. The Wanni hatpattu, in which Balalla lies, is known to have been at one time a cotton-raising district, and it was hoped to revive the industry by encouraging the cultivation of a better variety of cotton than the coarse short-staple "Tinevelly," which was commonly grown in chenas from early times. So far the idea of carrying out a system of rotation, with cotton as the chief crop, cannot be pronounced a success, but the results from cotton itself have been decidedly encouraging, so much so that the proposal to close the garden, owing to obstacles in the way of efficient maintenance, has not met with the approval of the Govern-

ment Agent of the Province, who is inclined to think that it serves a purpose, and has offered to assist in overcoming the difficulties experienced in its upkeep.

The Weragoda garden, situated three or four miles from Ambalangoda, was originally started and worked for some years as a market garden by a syndicate of members of the Galle Wellaboda Pattu Society, with the result that the cultivation of vegetables of good quality was largely taken up in the district. Subsequently it was decided to clear a further area of land and grow more permanent crops, especially fruit trees; and the offer of Mr. N. A. S. Jayasuriya, a member of the local society, to take over and work the garden was accepted. Mr. Jayasuriya, who is keenly interested in its development, has met all expenses for the last few years and given his personal supervision to the work. As a centre for the spread of fruit cultivation this garden should prove of considerable value, and Mr. Jayasuriya deserves the thanks of the Society for the very useful work he is carrying on.

At Kalalgamuwa, situated between Teldeniya and Alutnuwara, a garden has been worked for the past two years under the direct supervision of the teacher of the Government boys' vernacular school at Mediwaka, advised by Mr. Molegoda. The teacher, who is as enthusiastic as he is energetic, has a good record of work in his school garden, and his voluntary offer to take charge of the garden was, in view of his influence in the district, readily accepted. Here the cultivation of various new crops was taken in hand, the chief of which is Cotton of different kinds—Sea Island, American long-staple, and Egyptian. Of these, the Black Rattler—recommended by Prof. Dunstan—gave the most satisfactory results. Other crops that have done well, and are likely to be taken up in the district, are Coriander—for which there is a good local demand, at present met by importations from India—Hickory King Maize, and the Cluster Sweet Potato. The last mentioned is fast spreading through the Island.

An effort made to establish a garden for the Chilaw-Puttalam District was, owing to a variety of circumstances, not a success.

The garden at Madipola, fifteen miles from Matale, is devoted to an experiment in the rotation of dry land crops (referred to previously). Here, too, the services of the local schoolmaster have been requisitioned. The garden is, in fact, only an extension of the school garden proper, and has so far received careful attention from the teacher.

The extension of fruit and vegetable cultivation in the Provinces, through agency of circuit-bungalow gardens, is being carried on in the Kegalla District with the co-operation of the Assistant Government Agent and his Ratemahatmayas. A proposal to work out a similar scheme for the North-Central Province has been put forward by the Government Agent.

With a view to giving the Agricultural Instructors a permanent interest at headquarters, it is suggested that a stock garden, one or two acres in extent, for the distribution of seeds and plants, might be established with advantage; and the possibility of acquiring suitable blocks of land for the purpose is being inquired into. These stock gardens should also be able to conveniently meet the requirements of school gardens.

Distribution of Plants and Seeds.

The usual indents for exotic vegetable seeds and grafted fruit plants were made for the south-west and north-east monsoon seasons, and a large proportion of the members took advantage of the facilities offered by the Society for procuring good seeds and plants at actual cost price. The number of fruit tree grafts ordered during the year was 1,622.

Satisfactory reports have been received regarding the mango grafts, many of which have already come into fruit. Oranges are rather slower in coming to bearing, but the following report received from a landowner in Chilaw is an indication of what may be expected from oranges grown in suitable situations:—"I have had wonderful success with your oranges on my Chilaw property. The trees are scarcely ever without fruit; at present they have between 500 and 1,000 on each tree, and I wish you could see them. I have not applied any sort of manure to my trees."

Branch Societies.

Few of these societies can be said to be alive to their own interests. Among those in active operation are the Dumbara, Kegalla, Wellaboda pattu (Galle), Hambantota, and Rayigam korale branches.

The Dumbara society has served as a model of what a branch society should be, and its success in improving the agricultural status of the people of Upper and Lower Dumbara, and infusing into them a practical interest in rural economy, is mainly due to the disinterested efforts of Mr. William Dunuwille, Dissava; Mr. R. E. Paranagama, Ratemahatmaya; and Mr. C. Rasanayagam, Mudaliyar. The reorganization of the majority of branch societies is much to be desired, and is a matter that calls for early attention.

Agricultural Shows.

In the Kalutara District the annual village shows for the Totamunas and the Rayigam and Pasdun korales were held at Kalutara, Bandaragama, and Bellana, and showed a decided advance on previous efforts. These village shows have now been held for three years consecutively, and their influence for good has been considerable.

Other shows in contemplation were postponed in view of the All-Ceylon Exhibition to be held during the first week in July, 1912. The idea of holding an exhibition representative of the whole Island originated with the Secretary, who for some time found it dfficult to induce a member of the Board to make it the subject of a resolution, till Mr. John Ferguson, on his return to the Island after an absence in England, undertook to father the idea, and successfully pleaded for such an undertaking at a meeting of the Board held in April, 1911. The Secretary of the Society was appointed Secretary of the Exhibition Committee, but was compelled to retire from the latter office on medical advice.

By the time this report is in print the Exhibition will be *un fait accompli*, and, judging from the elaborate arrangements being made by the able Secretaries to whose hands it has been entrusted, should prove thoroughly representative of the agricultural and industrial resources of the Colony.

Paddy (Rice).

The senior instructors have acquired considerable experience with regard to the conditions and requirements of the paddy cultivator in the various districts of the Island, and I should here wish to mention the special work done by Messrs. Chelliah and Wickremaratne in connection with demonstrations in the working of implements, proper methods of tillage, transplanting and other cultural details.

As regards the manuring of fields, it would appear that the most economical and efficient means is the use of green manure crops, such as cow pea (*Vigna catiang*), sunn-hemp (*Crotalaria juncea*), and wild indigo (*Tephrosia purpurea*). The adoption of such a system of conserving the fertility of the soil is full of promise to an industry which in most parts of the Island is in a sad state of depression.

Of recently introduced paddies, the most popular is that known as Rascadam, a Central Indian variety, obtained through the Madras Department of Agriculture.

One of the most important means for effecting the improvement of the yield of paddy, which in some parts is incredibly low, is seed selection. It is to be regretted that so little work has hitherto been done in this direction.

CO-OPERATIVE CREDIT SOCIETIES.

The Ordinance dealing with these societies has now passed into law, and it only remains for the initiative to be taken by those who desire to benefit by its provisions. Up to now only the Dumbara Agricultural Society has extended the practical benefits of an Agricultural Bank to its members, and given them an opportunity of realizing the advantage of financial aid granted on a constitutional basis.

The Wellaboda pattu (Galle) branch has decided to follow the lead of Dumbara, and it is to be hoped that other bodies will not be slow in deciding to provide the goiya with his much-needed capital, to the absence of which is to be attributed his lack of enterprise and contentment with his present position as a producer.

TOBACCO.

The complete report of Mr. J. van Leenhoff, the tobacco expert, on the tobacco industry of the Island, has been published, and it is, therefore, unnecessary to make more than a passing reference to it.

The chief point which Mr. van Leenhoff brings out is that no extensive growth of a new tobacco should be undertaken until it is definitely ascertained by scientific investigation that the particular variety is the best suited to local conditions of soil, climate, &c.

In Dumbara a syndicate of the local society's members are growing and curing tobacco for the foreign market, with the advice of Mr. J. V. L. Valabane, a Dutch tobacco planter. The main object in view is to grow a good filler leaf, which is considered to be most likely to succeed, instead of attempting to compete with Sumatra in producing a high class wrapper. The cigars manufactured under Mr. Valabane's supervision have found a ready local sale.

COTTON.

Cotton growing is making slow progress. It would appear that though small plots of Sea Island have done very well, the American long-staples are most likely to succeed under extensive cultivation. Reporting under date May 7, 1912, on the Black Rattler cotton grown at Tumpane, Prof. Dunstan states:—"The lint is clean, fairly lustrous, soft, fine, cream coloured, and free from stains; with 'middling' American at 6·57*d.*, its commercial value may be put down at 8½*d.*; the cotton is of good, useful quality, and would be readily saleable in the United Kingdom."

The varieties known as Cambodia and Sakellarides have stood dry conditions particularly well.

The recent fall in the European cotton market has been most unfortunate just at this juncture.

As agents of the British Cotton-growing Association, Messrs. Freudenberg & Co. have done much to push the industry, but it would appear that what is wanted is a series of well-controlled plantations of respectable size, and in the most promising districts, particularly those in which the ordinary crops of the Island do not thrive.

Sericulture.

The Silk Farm at Peradeniya has been working steadily under the control of the Salvation Army, and making practical progress in the direction of a local silk industry. The special sericultural exhibit which the Society is making at the All-Ceylon Exhibition will better explain the position to which the work at the farm has attained than any mere description.

Samples of silk forwarded to the Imperial Institute were reported on as marketable silks, and valued at from 12s. to 13*s*. per lb., with East Indian Surdah at 11*s*. 3*d*. to 11*s*. 9*d*. per lb.

Apiculture.

The long-expected machine for making comb-foundation for *Apis indica* has been received, and should give a considerable fillip to the operations of local apiarists, chief among whom are Messrs. A. P. Goonatilleka, J. P. Obeyesekere, and J. A. Victor Perera. The demand for comb-foundation is likely to extend to India and other tropical countries.

It would appear that the ultimate success of a local industry depends upon the exploitation of the indigenous honey bee, rather than that of a foreign species.

Acknowledgments and Thanks.

In conclusion, I desire to record the thanks of the Society to His Excellency the Governor as President of the Board, as well as to the Hon. the Colonial Secretary and to other Government officials who have in various ways furthered the work of the Society.

The Society owes much to Prof. Wyndham R. Dunstan, Director of the Imperial Institute, for the ready manner in which he has responded to the many inquiries that have been submitted to him, and the investigations and reports he has made. The Society has been fortunate in having so well-equipped an institution as its ally, and the periodical Progress Reports that have been published afford ample testimony of the valuable assistance it has rendered.

The expert advice of the scientific officers at Peradeniya has been frequently sought and willingly afforded.

I would extend a hearty welcome to the new Director of Agriculture, Mr. R. N. Lyne, in whose hands the future destinies of the Society are in safe keeping, and before whom lies a great work in consolidating the various economic interests (agricultural, horticultural, and botanical) of the Colony.

C. DRIEBERG,
Secretary.

Colombo, June 29, 1912.

THE CEYLON AGRICULTURAL SOCIETY.

Statement of Receipts and Expenditure for Twelve Months ending December 31, 1911.

Receipts.		Amount. Rs. c.	Total. Rs. c.
Balances at Bank of Madras, &c., December 31, 1910		—	40,433·60
Members' Subscriptions :—			
Local subscriptions for 1908		11·00	
Do 1909		76·00	
Do 1910		626·00	
Do 1911		4,277·00	
Do 1912		416·00	
Do 1913		24·00	
Foreign subscriptions	379·00		
Less paid to *Ceylon Observer*	275·25		
		103·75	
Life Members' subscriptions		100·00	
			5,633·75
Government grant for 1911		—	30,000·00
Interest :—			
On Bank of Madras account		—	686·97
Total ...			76,754·32

Payments.		Amount. Rs. c.	Total. Rs. c.
General Expenditure :—			
Organizing Vice-President ...	3,000·00		
Secretary ...	3,000·00		
Clerks and peons	2,760·03		
Agricultural Instructors ...	3,770·42		
		12,530·45	
Stationery		195·46	
Postages and Telegrams...		869·27	
Office furniture ...		275·71	
Bank charges and commission		24·22	
Miscellaneous petty expenses		368·01	
Auditors' fee for 1910 accounts		150·00	
Advertising		1·50	
			14,414·62
Travelling Expenses :—			
Secretary, Ceylon Agricultural Society ...		1,674·80	
Agricultural Instructors		5,270·45	
Show Judges, &c. ...		129·75	
Organizing Vice-President and staff		922·29	
			7,997·29
Tropical Agriculturist and Magazine of Ceylon Agricultural Society :—			
Printing English Magazine		5,268·16	
Sinhalese Magazine :—			
Editor's fee	Rs. 450·00		
Printing, Postages, &c.	,, 577·00		
	Rs. 1,027·00		
Less subscriptions received	584·00		
		443·00	

Payments.—(*Continued.*)		Amount. Rs. c.	Total. Rs. c.
Brought forward ...		443·00	22,411·91
Printing			
Tamil edition		200·00	
			5,911·16
Agricultural Shows :—			
Market Shows... ...		150·00	
Cost of medals, die, &c. ...		88·00	
Grants to Tissa and Dedigama		100·00	
		338·00	
Less cash received for medals		113·00	
			225·00
Sericulture Experimental Farm :—			
Coolies' wages		12·18	
Commanding Officer, Salvation Army, grants ...		2·000·00	
		2,012·18	
Less sale of Cocoons ...		1·43	
			2,010·75
Experimental Gardens :—			
Balangoda		150·00	
Balalla		240·67	
Grants to Kegalla, Kalalgamuwa, Madipola, and Bandaragama gardens...		525·00	
			915·67
Seed Store at Government Stock Garden :—			
Teakwood shelves ...		55·00	
Seed boxes		17·50	
Miscellaneous expenses ...		85·22	
		157·72	
Less cash received, being unexpended balance of vote		91·19	
			66·53
Sundry Payments :—			
Agricultural implements		137·75	
Apiculture expenses : cost of comb-foundation machine		500·65	
Live Stock		243·46	
			881·86
Tobacco Experiment :—			
Coolies' wages, &c.		4,526·32	
Salary of Superintendent, &c.		2,812·50	
Travelling expenses ...		393·94	
Sundry expenses ...		145·72	
Reports		560·00	
		8,438·48	
Less Government contribution	Rs. 1,750·00		
Less part refund of advance	,, 300·00		
		2,050·00	
			6,388·48
Carried Forward			38,811·36

Payments.—(*Continued.*)	Purchases.	Sales.	Amount.	Total.
			Rs. c.	Rs. c.
Brought Forward ...				38,811·36
Seed Supply :—				
Excess purchases over sales			—	12·68
	Rs. c.	Rs. c.		
Vegetable seeds	166·18	166·85		
Paddy ...	66·77	3·50		
Cotton ...	43·72	5·30		
Pila ...	—	189·65		
Grafted plants	1,744·63	1,468·81		
Congayam grass	7·49	—		
Soy beans ...	307·24	753·79		
Ground nuts ...	39·75	5 00		
Tobacco ...	—	5 00		
Sundries ...	147·93	20·60		
Forward	...			38,824·04

Payments.—(*Continued.*)		Amount.	Total.
		Rs. c.	Rs. c.
Brought forward			38,824·04
T. purpurea ...	144·72	68·10	
Coconut ...	—	63·00	
Chilli ...	42·26	—	
Expenditure in distribution	51·59	—	
	2,762·28	2,749·60	
(Excess purchases, Rs. 12·68.)			
Balances in hand :—			
At Bank of Madras		37,871·04	
Stock of stamps		59·24	
			37,930·28
		Total ...	76,754 32

We certify that we have prepared this account of Receipts and Payments from the books of the Society, and that to the best of our belief it is correct.

FORD, RHODES, & CHURCH,
Accountants.

Colombo, April 20, 1912.

THE GIANT ORCHID.

One of the most interesting plants at Peradeniya is the Giant Orchid which is now in flower. It is to be found just outside the Orchid House, on a raised mound. This species (*Grammatophyllum speciosum*) is a native of Malaya, and was introduced into Ceylon before 1880. It is normally an epiphyte, *i.e.*, it grows on the trunks of trees, but it is able to grow equally well when planted in the ground. The Peradeniya specimen was treated as an epiphyte until 1896, when it was removed to a specially prepared mound, with the result that it flowered for the first time in 1898. The flowers are greenish yellow, spotted with reddish brown, and may attain a breadth of six inches; one hundred or more flowers are grouped in a long spike on a stalk four to six feet high. The Peradeniya specimen has borne more than twenty such flowering stalks at the same time, but at present it is not so luxuriant. A photograph of this interesting species was published in the *Tropical Agriculturist* for September, 1905.

THE WORLD'S BEST KNOWN FRUIT.

The Banana.

This is the designation which Mr. O. W. Barrett, in writing to the *Philippine Agricultural Journal*, gives to the banana, which he tells us has travelled further and helped to feed more human beings than any other fruit.

The origin of the words "banana" and "plantain" are obscure. They are really interchangeable, though some would confine banana to the dessert fruit and plantain to the cooking variety.

There are said to be 250 or more kinds of bananas and plantains. It is probable that all these were evolved from the numerous wild species found in Africa and Southern Asia.

As a Root Crop and Basis for Liquors

Dr. O. F. Cooke, an American authority, believes that the banana was originally grown as a root crop till the value of the fruits, rendered seedless and of better quality by cultivation, was discovered.

Among banana preparations which are little known are a wine, champagne,

cordial, coffee, sugar, vinegar, flour and figs.

Costa Rica alone produces over 9,000,000 pestos, which is about half of the total value of the exports of that country.

Jamaica produces 15,000,000 bunches valued at 8,000,000 pestos, the bulk of which goes to the States and the rest to Europe. Brazil ships over 500,000 bunches to Argentina: Paraguya sends to Buenos Ayres, Honduras exports nearly 4,000,000 pestos worth to the States, while Panama sends nearly 3,000,000 pestos worth.

About 130 "banana boats" ply between tropical America and the United States. Each can carry from 20,000 to 60,000 bunches. The fact is mentioned, which is little if at all known locally, that the banana produces at least three

DISTINCT KINDS OF SUCKERS,

and that much depends upon the proper selection and treatment of these.

By special treatment it has been found that the banana can be made to produce seed.

THE PROPERTIES AND MANUFACTURE OF RUBBER.

Dr. Philip Schidrowitz deals with this subject in his able lectures on rubber at the Royal College of Science. It had not been ascertained whether the nitrogenous insoluble matter present in considerable quantities in some rubber does not play an important part in regard to quality. The common idea that rubber contracted under heat is not correct; it only applies to rubber in a state of tension. There is no connection between viscosity of a rubber solution and the strength of the material.

The materials employed in

RUBBER MANUFACTURE,

that is the manufacture of rubber articles, comprises, beside rubber, such substances as mineral and organic fillers, pigments, sulphur and vulcanizing adjuncts. Rubber and sulphur alone are not enough. A tyre cover so made would soon be cut to pieces.

As regards rubber substitutes the only question is whether at the price they could be sold it would be as good or better than rubber.

Rubber is used extensively for lighting and power work, but not so much as before for telegraph and telephone cables. Rubber is not an ideal insulator, but properly made, rubber mixture is of the greatest value, and a superior grade rubber could not be improved upon

AS A MECHANICAL PROTECTION.

Owing to high prices, however, rubber has had to make way for lead and bitumen compositions. For deep submarine cables gutta-percha is almost exclusively employed. The advantage it has over rubber is that it is plastic and readily jointed, and good gutta-percha mixings do not harden at ordinary low temperature. The falling off in the high grade gutta-percha would necessitate the use of rubber for submarine cables, and the difficulty at present attending its use could be got over. One great advantage with regard to rubber is that manufacturers could always rely on a large, constant and homogeneous supply of the pure material.—(Summarised from the *Indian Rubber Journal.*)

THE RICE INDUSTRY OF BURMA.

FORMS 70 % OF THE EXPORT TRADE.

Mr. F. J. Warth, Agricultural Chemist, Burma, writes an interesting account of this industry in the *Agricultural Journal of India* (April 11, 1912).

The total cultivated area in Burma is about 135 million acres, of which 10 millions are under paddy, and the produce of nearly 6 million acres is consumed locally.

The value of paddy and its products at present amounts to 70 per cent. of the entire export trade.

In 1895-6 the rice exports were valued at 96 million rupees ; in 1909-10 it rose to over 222 million.

Almost all the paddy is husked and milled before shipment. A large milling industry, and transport trade by rail and rivei, is fed chiefly by the paddy crop.

The average annual export of rice and its products during the last five years amounts to nearly 2½ million tons.

Bengal, East Bengal and Assam, Burma and Madras together

PRODUCE 80 PER CENT.

of the rice grown in the Indian Empire.

Statistics show that while in Bengal and Assam the population is about two per acre of paddy, there is just one individual per acre in Burma. This explains why Burma is able to export so much.

Allowing for waste during storage, the high seed rate and other causes, half an acre per individual may be safely allowed as the rate of consumption. This means a total, as already stated, of 6 million acres per annum. As 10 million acres are cultivated, there is available for export something over 4 million acres. Taking ·65 to ·7 tons as the average outturn per acre, this means 2·5 to 2·6 million tons exported.

INCREASED PRODUCTION.

So much as regards the present ; what of the future? That depends greatly upon the increase of population. With the favourable agricultural and economic prospects of the country it may be assured that the rate of increased production which has occurred during the last decade (14 pei cent.) in spite of the increase of population will continue for some time to come at least.

It may be reasonably supposed that in fifty years' time there will be a population of 20 millions, for which the 10 million acres at present under cultivation will just suffice. But there are over 11 million acres of cultivable waste land, and it may be taken for granted that 4 million acres of this could be brought under paddy ; so that Burma could still maintain the present rate of export, provided the fields do not decrease. All things considered, it is probable that the fields will be maintained. It is likely also that reduction of the present excessive rate of sowing and prevention of loss in storage and in milling will help to increase the available amount of paddy.

THE HISTORY OF GARDEN IMPLEMENTS.

It would be interesting to know what form the first implement for the cultivation of the soil may have taken—interesting, but probably quite impossible. It is permitted, however, to hazard an opinion ; and it may be guessed that the unshod semi-barbarian would either employ a forked stick to tickle the virgin soil, or, when once the use of metals was discovered, loosen the earth to a greater depth by the

USE OF A SINGLE-PRONGED MATTOCK.

The spade, in its present form, with a clamp for foot pressure, would be useless until civilisation had advanced to the stage of the wearing of shoes; so that probably all the tools used for digging were sharp-pointed in the nature of a fork. Even as late as the 17th century a spade of triangular shape was used, as portrayed in *Husbandry Spiritualized*. In Lawson's *New Orchard*, of earlier date, a

ROUND-MOUTHED SPADE IS SHOWN.

All the ancient nations of the East possessed husbandry implements of an advanced kind, including pumping machinery for the raising of water with which to irrigate gardens. They had spades, forks, rakes, shears for the clipping of hedges and shrubs, hooks, and scythes ; all these by no means inferior to those in use here, at any rate, up to a not-far-distant date. Fitzherbert (1,534) tells his readers that forks were made of wood as well as of iron, and describes the right kind of branch for making them. Rakes were often toothed with willow wood. He also mentions knives used for various purposes, and

SCYTHES, STAFF-HOOKS, SICKLES, HOOKS, MALLETS, SAWS

of different kinds, hatchets and bill-hooks. Tusser (1575) notes among other tools, the trowel and the dibble. In an early engraving of garden tools there is a composite tool of wonderful ingenuity, of which the head is a hammer, the shaft a file, and the end a gimlet! The knives of this period did not shut, but were made like other small tools, with an eye for hanging on the workman's belt.

At one time knives were imported from Liege, and were known in the north as "joctelegs," or "joclegs."

An ancient forefather of the

GARDEN ENGINE

is shown in one of the gardens in *Gardeners' Labyrinth*; a labourer is represented watering a flower-bed by means of this engine, which is merely a movable force pump. In another engraving water is being drawn from a well by means of a pail. For watering small seeds a primitive and yet highly scientific method was employed. An earthenware pot, with perforated bottom and a very narrow opening was dipped into a cistern or pool; when full the hole at the top was stopped with the thumb. This prevented the egress of the water until the spot was reached at which it was intended to be used, when, the thumb being withdrawn, the water descended like rain.

THE TRAINING OF FRUIT TREES

to walls and espaliers did not become customary until the reign of Elizabeth, and the first ligatures were made of the inner bark of Elm, or the small twigs of Willows, the material of which the espalier was made being wood. Long before this period, however, a practical knowledge of outdoor gardening was quite common. The garden was, in the main, the care of the housewife, but we read of trenching and other operations, which show that the benefit of deep cultivation was well understood, and this work must have been performed by male labourers.

It is interesting to note, in connection with the subject of

DIGGING,

that the old name for spade was "spitter," a word now obsolete. From this word we derive the expression "a pit of turf," the word used in Scotland being "spading."

Forcing used to be carried out in a very primitive manner. Melons were planted on hot-beds composed of manure or other suitable material, and were protected by covering of glazed paper. The next step was the forcing of wall fruit and grapes by banking the heated manure against the opposite side of the wall—wood was used, hence "pales," the better word—to that on which the trees were trained. Next we have

THE IDEA OF A FLUE

carried beneath the floor of a greenhouse (roofed with slate!); and Evelyn, who described the method with enthusiastic admiration, thought it so vast an improvement on the old open, charcoal fire, that he took the trouble to have the whole system illustrated with engravings. A few years later the flues which heated the vine wall at Belvoir were supplemented with glazed sashes placed against the walls. There we have at once the germ of the modern greenhouse, all later developments being merely improvements on the original idea. It was not long before Pineapples and tender exotics began to be cultivated, and the flues were arranged to meet the varying demands of horticulturists. The flue-heated structures were extremely satisfactory in many ways. The structures were adapted in 1788 (at first)

TO STEAM HEATING,

but when, about 1827, hotwater heating became more usual, they served this purpose equally well, and even now one may find, here and there, a flue-heated hot-house.

The proper form of a boiler has always been a serious question. The saddle was early introduced, then there was a

conical form, so early as 1840, and the tubular, an improvement on the conical, introduced not long subsequently by Weeks, of Chelsea. More than forty years ago the veteran, Henry Cannell, invented

THE SECTIONAL BOILER,

and the Trentham, so usual in large establishments, was an even earlier introduction. With our perfected screw-down valves, we can scarcely comprehend the difficulties the early heating engineers experienced. It was not unusual to have a boiler for each structure, and an early attempt at heating more than one consisted in leading the heated to an elevated tank with metal plugs, which were withdrawn to allow the water to circulate through the apparatus in the various houses.

The main principles of circulation were soon discovered, though it was long before the arrangement of pipes was sufficiently simplified. It seems amazing now to think that, quite a short while ago (1829-30), the question was seriously discussed whether iron or earthenware is the better material for the conveyance of the hot water!

THE ADVENT OF THE LAWN MOWER

marks a definite stage of advance. Until about 1831 all grass had to be cut by means of a scythe, or some other hard-worked instrument; but at that time an adaptation of Budding's machine for removing the inequalities of cloth came into use. The principle of all lawn mowers is the same as that of the original one, but many improvements have been made in the carrying out of the idea.

SYRINGES AND GARDEN ENGINES

have been in use for very many years; but it was not until Reid invented the ball-valve that the type of syringe appeared which is now universally used. This method is adopted to garden engines of all kinds, and has been employed for nearly a century. Vermorel's "Eclair" sprayer is another great improvement, and so ingenious and satisfactory are now most of the sprayers in use that it would seem almost impossible to make further advances in this direction.

FUMIGATING METHODS,

again, have undergone tremendous changes during the present century. The old way was to sit by an iron fumigating pan, feeding the fire with strong-smelling tobacco paper, until the building was sufficiently disinfected. At the present day it is only necessary to arrange the vaporising equipment, apply a lighted match to the fuse, and walk out, knowing that the deadly nicotine will do its work untended. In the direction of

PRUNING INSTRUMENTS,

the advance made has not been quite so striking. A century ago there were secateurs, averruncators, tree-pruners, and flower and fruit gatherers, and these were quite as common as garden shears, forks, and spades. Of course, the secateurs and French branch-pruners of the present day are superior to the old type. In these, as in most implements, the advance has been in the direction of greater lightness, combined with equal or, perhaps, greater strength.

If we compare the clumsy methods the early

TRANSPLANTERS

employed, one of which was to prepare the tree to be lifted, and leaving it till a hard frost had rendered the ball of soil hard and unbreakable with the systems which have been in use now for a number of years, the advance will be seen to be very great. The first great step in advance was that by which Sir Henry Stewart studded his park with large trees, the machine used being composed of two wheels and a long pole, what is now termed a janker. It is first illustrated and described in Menteath's *Planter's Guide* (1824). A little later, McNab, of Edinburgh, invented a system of raising the trees or shrubs. Then, about fifty years ago, Charles Kelly in Cheshire, successfully, but at great expense, moved large trees up an inclined plane, and lowered them into position in the same way. I am not sure whether

Baron or Kelly was the earlier, their systems being on similar lines.

Space does not permit of drawing attention to the numerous modern expedients for

POT-WASHING, WEED-KILLING, VERMIN EXTERMINATION,

and other necessary operations. All these have been placed at the disposal of the gardener within a comparatively short period, and have wonderfully lightened his labour and shortened his hours.—B. in *Gardeners' Chronicle*.

NITRATES IN THE SOIL.

PLANT NUTRITION AND NITROGEN.

We give below a summary of a paper by Dr. F. L. Stevens, of the Porto Rico Agricultural College, originally read before the Society of American Bateriologists at Washington, and reproduced in *Science* of June 28th :—

In spite of the close study of the relation of nitrogen to plant life, during the last two centuries, there still remains some of the most fundamental questions for solution.

It has been clearly demonstrated that

NITROGEN IS ESSENTIAL TO PLANT LIFE,

and certain of its functions in plant economy have been definitely ascertained; but it is rather puzzling to find that though a soil contains an abundance of available nitrogen sufficient for a number of crops, it is benefitted by the addition of still more nitrogen. It has been suggested that nitrogen compounds may serve other uses than by being absorbed or even assimilated. But what uses?

As an element of nutrition, however, the importance of nitrogen cannot be questioned; and this raises the question

"IN WHAT FORMS IS NITROGEN AVAILABLE TO THE PLANTS"?

The answer to this has been emphatic, and has been accepted for many years, but it is thought that it has been founded on insufficient evidence and therefore likely to be modified as the result of further research.

The generally accepted view is that the nitrogenous food of plants takes the form of nitrates.

Nitrification is the result of two processes—the conversion of Ammonia into Nitrites and the latter into Nitrates—each process depending upon the activity of specific groups of bacteria. Ammonia is thus essential to nitrification, and ammonification of organic matter may be said to go on in all soils. Only in exceptional cases is ammonification retarded by the action of predatory pro tozoa. But

THERE HAS BEEN A MISCONCEPTION

in supposing that nitrifying organisms are practically present everywhere—an assumption which a bacterial soil survey by Dr. Stevens shows to be unwarranted; so that while there is no deficiency in ammonification, the degree of nitrification may fall below the requirements of a good crop.

The reason for nitrification being less vigorous in some crops than in others is not known.

It may be due, in some cases, to excessive acidity, moisture, etc., but in others no reason is assignable. Abundance of organic matter cannot be said to check it, since it proceeds in pure cattle manure.

"DENITRIFICATION,"

or the destruction of nitrates by bacteria is detrimental if it proceeds below the Ammonia stage, *i.e.*, if it results in oxides or free nitrogen. The mixing of nitrates with blood, cotton seed, &c., should afford ideal conditions for denitrification, but no definite experiments have been made to ascertain what conditions favour or retard the process. Dr. Stevens thinks it absolutely necessary in bacteriological work to make tests in soils and not solutions, pointing out that organic matter inhibited nitrification in solutions but not in soils.

IS NITRIFICATION OF SUPERLATIVE VALUE

as we have been led to believe by scientific workers?

Organic nitrogen may be in the form of proteids, albumincids, anides, and alkaloids, and the bulk of the soil nitrogen exists as acid-anides and amino and amino-acids. The tendency at the present day is to refer to ammonia as well as nitrates as being available to plants.

Neither actual manurial field tests nor water culture experiments have clearly determined the exact form in which nitrogen is taken up. Pitsch and Mazé believe that ammonia is not less valuable than nitrates in the case of some plants (*e.g.*, maize). Peaty soils devoid of nitrates support an ample growth, while rice responds well to Ammonia in soils where no nitrification can be detected. The presumption is that certain plants respond readily to organic matter or ammonia, and that nitrification is often not an essential factor. The

General Conclusion

is that Ammonia and Nitrates can be used by plants, but their relative availability has yet to be determined. That ammonification is the essential thing and nitrification is of secondary importance is indicated but has still to be proved. With definite knowledge we shall be in a position to meet the requirements of plants by raising or lowering the tendency to nitrification or denitrification. To attain such knowledge plant physiology must join hands with soil bacteriology.

WATER LIFTING.

Mr. Chatterton, Director of Industries in Madras, speaking at the recent Show held at Coimbatore, made special mention of a pump which he and Messrs. Massey & Co. have brought out, the working of which was demonstrated at the Show. It consisted of a 3½ H.P. oil engine driving through suitable gearing a pair of loose piston pumps. Each pump is 6″ in diameter, and the pair are capable of lifting about 6,500 gallons per hour from a depth of 40 feet. A smaller pump 5″ in diameter is also made. It is driven by a 2 H.P. engine, and when fixed to a well 29½ feet deep, it discharged 41,140 gallons per hour. A still smaller pump 4″ in diameter discharged 1,900 gallons per hour lifting from a depth of 33 feet. The chief advantage of these pumps is that they can be worked in wells of considerable depths, and can deal with comparatively small quantities of water.

FUNTUMIA RUBBER.

The following is an extract from a report by Mr. H. N. Thompson, Chief Conservator of Forests, Lagos :—

(*a*) *Funtumia elastica.* The overhead cover of large Forest trees is being gradually removed either by girdling or felling the latter. Since my last visit to the Reserve in February of this year a great many of the girdled trees have lost their leaves and died, so that the shade cast by them is now a negligible factor in retarding the growth of the rubber plants. The latter have responded well to the extra light let in and are showing good growth. The best examples of this species, however, are to be found in the plantations that were made on the sites of abandoned farms free of high Forest growth. Here age for age they are quite as good as any to be seen in the Communal Plantations of the Benin City district. There appear to be large numbers of wild rubber trees in the Reserve, but owing to the drastic treatment they received years ago from the natives (before the forest was created a reserve), they give a comparatively poor yield for their size. However, the results of recent tappings show that on the average their yield is just double that of the plantation trees that are 18 inches and upwards in girth.

Tapping.

Tapping was started in the Reserve on the 1st of May, and up to the end of June the results were as follows :—

Plantation Tress.

Number tapped ...	1,954	
Yield of rubber in biscuits	1,146	
Yield of rubber by weight	114·6	lbs.
Average yield per tree	·96	ozs.
Wild Trees.		
Number tapped ...	354	
Yield of rubber in biscuits	405	
Yield of rubber by weight	40·5	lbs.
Average yield per tree	1·8	ozs.

The total yield of rubber up to the end of that period was 185 lbs. (this includes 30 lbs. still in the drying shed at Mamu) and the expenses of tapping amounted to £15 11s. 4d., or at the rate of 1s. 8d., a pound—a not unsatisfactory figure, but one capable of further reduction as the tappers become more expert. A further sum of £6 was spent in purchasing utensils, knives etc., but this being of the nature of capital expenditure has not been included in the cost. With that sum added on the average cost per pound amounts to 2s. 4d., or £21 11s. 4d. in all.

If the rubber sells at 5s. per lb. out here, the 185 lbs. will realize £46 5s. 0d., and the net profit will be £46 5s. 0d.—£21 11s. 4d=£24 13s. 8d., or at the rate of 2s. 8d. a lb.

PREPARATION.

The rubber was prepared in the same manner as in Benin, viz. by the boiling method with subsequent smoking and is of excellent quality. It should realize good prices at home. On the whole it is better prepared than that shipped to England last year from the Benin Plantations.

Very little injury has been done to the trees that were tapped with the "Christy" knife, and cuts a month or so old at the time of my visit had nearly completly healed up. It also appears probable, though the experiments have not yet been concluded, that by using this knife the trees can be tapped two or three times in one year with but little diminution in yield as compared with the results of the first tapping.

An extraordinary feature of the Mamu trees is the fact that the weight of the biscuits prepared from their latices has been quite constant all through; ten biscuits weigh almost exactly one pound.

Consignment after consignment has given the same figures. Of course these results are mainly due to the same percentage of water being used to dilute the latex before it is boiled and to the same quantity of this diluted latex being used for the preparation of each biscuit, but even allowing for this the results show an extraordinary constant proportion of rubber to latex which appears to have been unaffected by the state of the weather at the time of tapping.

PARA RUBBER PLANTATIONS.

The growth of this species is poor compared with results obtained in the moist districts close to the sea; it is also much exposed to damage from the large rodent known as the "Cut grass," and taking every thing into consideration I think it will be unprofitable to continue the cultivation of this species at Mamu.

RICE IN TRAVANCORE.

The Agricultural Journal of India for April last contains an exhaustive account of rice cultivation in Travancore written by the Director of Agriculture. In that progressing State 1,200,000 acres are under cultivation, of which 500,000 represent rice fields; and yet the output of grain is insufficient for the local demand of a steadily increasing population. In 1909-10 the imports of rice amounted to Rs. 7,422,240.

It is suggested that the output should be increased by improved methods of cultivation.

Irrigation facilities, where the rainfall is deficient, have been provided by means of tanks and the damming of rivers.

Where manuring is done, cattle manure is generally applied to the first crop, 10 or 12 cartloads being applied per acre; while the second crop is manured with green leaf which costs from Rs. 3

to Rs. 4 per cartload, five or six of which go to the acre. The leaves of the following trees are employed:—*Thespesia populnea* (Sin. Suriya), *Calatropis gigantea* (Sin. Wara), *Cassia fistula* (Sin. Ehela), *C. Auriculata* (Sin. Ranawara), and *Tephrosia purpurea* (Sin. Pila).

The growth of these trees and shrubs is encouraged on all available waste land.

The following peculiar practice is in vogue in S. Travancore. When the seedlings are about 6 inches high water is let into the field, and the seedlings are lifted with soil (by means of the hand hoe) and placed upon a layer of green leaves spread over the ground. It is found that by this the seedlings are induced to develop fresh roots within a month and to grow luxuriantly.

Thrashing is done (1) by taking the sheaves one by one and striking them on the ground, so separating out about 95 % of the grain. The balance is got out by treading of cattle or beating with long sticks. (2), the second method is treading by men who hold on to air beams and rub the ears between their feet. Though laborious, the process is said to be efficient.

SEED PRODUCTION.

Improvement and Maintenance of Pure Seed.

One of the questions that came up before the meeting of the Board of Agriculture held at Pusa last November was the improvement and maintenance of pure seed of improved varieties of crops and the best organisation for effecting it. The report of the Committee, of which the Imperial Economic Botanist (Mr. A. Howard) was Chairman, was accepted by the Board and is expected to form the basis of future work as given below:—

The Committee consider that the general aim to be kept in view in the improvement of crops in India is the replacement, wherever possible, of the existing mixtures by pure types characterized by increased yield and by improved quality.

1. Methods of obtaining improved varieties.

The Committee strongly emphasise the necessity of all work in this direction being based on a study of the methods of pollination of the various crops investigated. It is especially necessary in the case of plants which cross-fertilize that this preliminary work be undertaken, otherwise much time and energy may be wasted in selection experiments and in variety trials which cannot possibly yield any useful result. It is desirable further that this initial work be conducted in the tract concerned, as several cases have recently occurred in which climate has considerably modified the usual pollination mechanism. For example, wheats cross to a far greater extent in the irrigated tracts of the Punjab than in the damper regions of India.

Selection.—In the case of self-fertilized crops the comparison of the progeny of single selected plants may easily result in the production of the desired improvement. In this case all that is necessary is to multiply the type and begin the work of seed distribution. In the case of plants which cross-fertilize, the procedure is not so simple, and special measures are necessary to avoid the consequences of vicinism.

Introductions.—In introducing varieties of crops from other tracts or countries it is necessary in the first place to study the constitution of the crop and to apply when necessary methods of selection. The immediate distribution of imported seed is undesirable owing to the possible prevalence of inferior types. Neglect of these precautions in the past probably accounts for the want of results in introducing exotic cottons into India.

Hybridization.—If the desired improvement cannot be obtained by selection, it may be necessary to cross suitable types and to evolve a new form combining the special characters desired.

Work on the above lines should result in the production of a stable agricultural type which alone should form the basis of future seed distribution.

II. THE TESTING OF VARIETIES.

In the testing of varieties of crops which cross-fertilize there are special difficulties to be borne in mind. The seed of different varieties grown side by side cannot be employed for the production of pure seed. For the same reason variety trials should not be conducted on seed farms unless special precautions are taken to isolate the plots from which the pure seed will be derived.

III. THE MAINTENANCE OF PURE TYPES.

The Committee lay great stress on the maintenance, by the Botanist in each Province, of a collection of the improved types introduced into general cultivation by the Local Department. This collection will serve as a source from which pure seed can be obtained whenever it is necessary to restock the seed farms.

IV. DISTRIBUTION TO CULTIVATORS.

The Committee are of opinion that the following main principles should guide the work of the Agricultural Department in the growth and distribution of seed to cultivators in India. These are

1. The desirability of concentrating the efforts of the department on one or two well-defined problems at a time rather than wasting its resources on indiscriminate seed distribution.

2. The desirability of confining the work of seed distribution in any one tract as far as possible to *one* sort and of systematically replacing existing mixtures by this pure type. This is particularly necessary in the case of cross-fertilized plants where degeneration through vicinism is of such great importance. The distribution of one sort only has the further advantage of creating large supplies of one particular type and thus forming a trade centre for this produce and attracting buyers.

3. The necessity of utilizing to the utmost the present staff and resources of the department, and of supplementing this by enlisting the assistance of leading agriculturists in the work of seed growing and seed distribution in the tracts concerned.

MADRAS AND CENTRAL PROVINCE AS EXAMPLES.

Applying these principles to the present projects in India, it was felt that Madras and the Central Province supply the most useful examples of successful seed distribution which deserve the closest possible attention on the part of all concerned in this work.

Among the successful schemes of seed distribution in Madras the replacement of the mixed crop by a pure Karungani cotton in Tinnevelly District is a notable achievement. This variety, originally found in a pure cotton tract, was tested on the Koilpatti Farm and proved to be a great advance on the local mixture. A system of seed distribution was then gradually built up, and, at the present time, after five years' work, there are 80,000 acres of this cotton in the district. The agricultural farm grows sufficient cotton to supply the contract seed growers and buys the unginned seed from these men, gins it and arranges the distribution of the seed to the village depôts before the sowing season. Each depôt supplies two or three villages, and a suitable man is selected as the depôt-keeper who retails the seed under departmental supervision at a fixed rate and on a commission of annas four per bag. The village is regarded as the unit, and every effort is made to get all the growers in each village to take up the seed. It is important to notice that the procedure follows that of the best seed growers in Europe, and that the seed grown by the contractors is under strict control and comes back to the department every year.

In the Central Provinces, equally striking examples are furnished by the Agricultural Department. In the cotton tracts the work of seed distribution is confined to two suitable kinds, and a fairly large supply of seed is produced on the Government farms which is distri-

buted to private seed growers, who themselves

RETAIL THEIR SEED TO THE CULTIVATORS.

In the wheat-growing tracts of this province, the efforts of the department are concerned with distributing a pure soft white wheat to selected *malguzars* who are members of the District Agricultural Associations. Each man agrees to sow a large area and to provide suitable arrangements for storing the seed and threshing the crop. In this way it is expected that beginning from a central farm a gradually increasing area of the wheat tract will be sown with one wheat only to the great advantage of the growers and the trade.

The main features of the above examples are that seed distribution starts from a central farm and gradually spreads outwards. The assistance of the best farmers is enlisted, the seed is fully charged for, and the work is conducted in tracts where markets already exist for the produce.

In concluding its recommendations on this portion of the subject, the Committee desire to draw attention to the desirability of some

BOTANICAL CONTROL IN

the work of the central seed farms, and suggest that, whenever possible, these should be visited by the Botanist. The Committee also wish to emphasise the need of great care in seed-growing both as regards cultivation and also as regards contamination from such sources as the seed of a previous crop-manure, irrigation water and the like.

V. Marketing the Produce.

The Committee desire to mention the importance of this subject in the work of seed distribution, and especially where distinctly improved crops are being grown. It is felt that, at the beginning at any rate, it is not possible for the people to get the real value of their produce and for the improvements to be fully recognised by the trade. At present quality by itself is sometimes a secondary consideration, but if combined with yields, the chances of successful introduction are greatly increased. The need is felt of some means of finding the real market value of the produce, and it is suggested the best way of doing this is to send to the best market and sell for several years there sufficiently large consignments of the produce.

In carrying out experiments of this nature, however, three points must be remembered :—

(1) That a single consignment in a large market or exchange is unlikely to attract much notice unless special attention is drawn to it.

(2) That single occasional consignments do not fetch the same price as produce of recognised value known to be regularly obtainable in large quantities.

(3) That as in the future the marketing of this produce must be in the hands of the local buyers and agents, it is advisable, where possible, to enlist their help and carry on this work with their cooperation.

MR. HERBERT WRIGHT ON RUBBER.

In his third lecture Mr. Wright outlines the origin of plantation rubber and refers to the work of Hancock (1834), Collins (1873), Cross and Wickman (1876).

The Rubber enterprise was at first entirely British; the original plants having been bought for 11s. each.

Ceylon plantations have grown from 300 in 1890 to 220,000, Malaya from 350 in 1897 to 100,000.

Mr. Wright advocates selecting seed for planting from those which give the highest yield of caoutchouc per unit of bark.

He favours the forming of a real agricultural department for the Malay States, and incidentally remarks that such departments in the East are sadly understaffed—one man being expected to cover an impossible field of research.

In his fourth lecture Mr. Wright speaks mainly about

TAPPING.

He describes the different methods, half-section, third-section quarter-section and basal tapping, and expresses himself as favourable to the quarter section system which does not allow the new bark to be retapped till after a lapse of four years. The record yield from a single tree is 480 lbs. in two years, or 160 lbs. dry rubber. Where the bark is cut away too rapidly or the trees tapped too vigorously the percentage of caoutchouc in the latex is seriously diminished.

In his fifth lecture Mr. Wright refers to

DISEASES OF RUBBER.

Any crop grown on large areas is bound to be affected by disease. The only way of dealing with affected plantations is by plant sanitation, for which the necessary staff of advisers and operatives is essential. The four important diseases are canker in stem and fruit (*Phytophora*); pink fungus (*Corticium*); die-back (*Botryopiplodia*); and *Fomes semitostus*. He deprecates the arrangement by which one mycologist is provided for 220,000 acres in Ceylon as wholly inadequate.—(Summarised from the *India Rubber Journal.*)

PLANTATION RUBBER PREPARATION.

In the *India Rubber Journal* for July, 1912, we find a circular drawn up by Mr. R. E. Thompson who visited Ceylon and the Malay States, which is worthy of note.

The question "What percentage of Dry Rubber of each grade do you make from the daily intake of Latex and Scrap" is foreign to most planters, and the following system by Mr. Thompson should be of help.

No. 1 grade should be made from the first Latex strained into cups and made in crepe or sheet as required.

No. 2 grade from the naturally coagulated lump should be carefully removed from the pail before the latex is poured into the strainer, and made into crepe.

No. 3 grade from the scrap off the trees made into crepe.

No. 4 grade from the bark shavings made into crepe.

No. 5 grade from the earth rubber made into crepe.

It is important that crepe should be made the same day as the latex is collected.

Daily percentages of dry rubber of the above grades should be registered, as this acts as a check on the quantites collected, and helps an owner to make firm offers if he be a contractor. One should bear in mind that any method by which No. 1 grade can be increased at the expense of No. 2, and No. 3 at the expense of No. 4 is important.

Smooth boxes should be used in packing to prevent splinters of wood coming in contact with the rubber, as this reduces the value of rubber.

COTTON IN THE COLONIES.

The British Cotton Growing Association's Report (No. 48 of April, 1912,) for 1911 reviews the cotton work of the Colonies, of which the following is a summary :—

INDIA AND CEYLON.

The proposal to cultivate cotton under irrigation in Sind has unfortunately been given up. Certain arrangements have, however, been made with Bombay spinners for better prices being given to those who grow superior varieties. There is no doubt that as a result of the Association's representations some of the cotton now grown is of much better quality and is acquiring a wider market.

In Ceylon Messrs. Freudenberg & Co. are still doing their best to foster the

industry which last year was checked by a severe drought.

West Indies.

There has been no great increase in cultivation, chiefly due to the fall in prices in 1911, though the market is now better. The outlook for West Indies cotton is hopeful, as the demand by specimens for the best Sea Island is likely to be steady, while it is not unlikely that this variety will ultimately be driven out of the States by the Boll weevil.

West Africa.

The crop suffered much owing to damage by wind, but good results are expected in 1912. The cotton has created a market for itself and is readily sold at good prices.

Gold Coast.

Pioneer work is being maintained and particular attention is being given to the Northern Territories. The outcome has so far not been of a promising nature.

Lagos.

The crop was reduced by wind-damage, but the quality has improved. As an encouragement a guarantee of 11s. 8*d.* per lb. for seed cotton has been given for 1912. It is expected that there will be an appreciable increase in the ensuing crop.

Southern Nigeria.

Work has been continued at Illshi with only moderate results as far as quantity, though the quality is most satisfactory. Seed is being raised for distribution.

Northern Nigeria.

No great results have been achieved within the year, but the construction of rail-roads and the improvement of water-ways has brought a large part of the country into economical touch with the rest of the world. As the outlook is promising, the Council have decided not to curtail expenditure. It is expected that the crop will very soon exceed 10,000 bales.

British East Africa.

It is very doubtful whether cotton under present conditions will prove a success on the coast. Cultivation is extending in the neighbourhood of Kisumu, where a cotton of the Uganda type is being raised.

Uganda.

There has been excellent progress here. The estimated crop of 15,000 bales has been exceeded by 4,000. This year crop is expected to go up to 25,000 or 30,000 bales, and it is hoped that in a year or two the yield will reach 50,000 bales. The British Africa Corporation, which is pushing the cotton industry, has effected much.

Nyasaland.

The progress here is continued and satisfactory and extension by European planters has been considerable, while among natives it has been even more remarkable. The great difficulty is transport, but that will soon disappear as a result of the extension of the Shire Highlands railway and the construction of a new line from Beira to the Zambesi and other similar projects.

Rhodesia.

The result of an experiment in growing 200 acres in co-operation with the British South Africa Company was not quite satisfactory owing to labour difficulties and damage by white ants, though the cotton produced was good and sold well. Experiments will be continued. There has been extension in N. E. Rhodesia under the North Charterland Company, and prospects are good. The Rhodesia Cotton Co.'s operations have not proved a success. The connection by rail of Fort Jameson with the Zambesi or Blantyre will facilitate further progress.

South Africa.

No great strides were made in 1911. The result of cultivating the Caravonica variety in Natal are reported to be disappointing.

Egypt and Soudan.

A deputation sent to the Soudan were much impressed with cotton possibilities. They are convinced that in the Anglo-Egyptian Soudan there is one of the very finest cotton-growing propositions in the whole of the British Empire both

for Egyptian and American Cotton. Negotiations have been opened with the foreign office with a view to taking immediate steps to push matters on rapidly. Lord Kitchener is taking the greatest interest in the project. There is a prospect of an ultimate production from Gizira alone of one million bales or more.

CONCLUSION.

The result of the past year's work, though disappointing in some colonies, are more than encouraging in others. Uganda is producing a large output; North Nigeria is making decided progress, and in the Anglo-Egyptian Soudan there are boundless possibilities. These, with the help of Nyasaland, should be able to supply all the cotton that Lancashire needs. The position to-day is most encouraging, and large and important results may be expected before long.

AMERICAN UPLAND COTTON.

The cotton belt of the U. S. A. comprises the following States:—N. & S. Carolina, Florida, Georgia, Alabama, Tennessee, Mississippi, Arkansas, Louisiana, Oklahoma and Texas: also part of Arizona, New Mexico, Virginia, Kentucky, Missuri and California, being grown under irrigation in the last. All these grow the upland except Georgia, Florida and S. Carolina where Sea Island is produced.

The average yield in America is about 11 million bales of 500 lbs. each, and the price has varied from 4d. to 7d. Upland cotton is the chief source of the world's supply, Indian and Egyptian cotton following a long way behind.

Indian cotton produces half the yield of American per acre, and the lint is less valuable; Egyptian gives double the yield and the price varies from 7½ to 10½d. The different varieties of upland cotton are classified as cluster, semi-cluster, naked seeded, short linted, big boll and long-stapled. In the last come Allen's, Griffin, and Black Rattler, For marketing the lint is passed as fair, middling fair, good middling, low middling, good ordinary and ordinary.

CULTIVATION.

After thinning out, plants are left in the rows at 12″ to 16″ in poor soils and 20″ to 24″ in good soils, and 3′ to 4′ between the rows. In Egypt rows are 15″ to 20″ apart, and plants thinned to 6″ or 8″ apart in the rows.

In America it is generally considered that with fertilizers and picking, and all other expenses, it costs 25 to 30 dollars to raise an acre.

The dimensions of the ordinary bale are 4′ × 2½′ × 2½′.

PESTS AND DISEASES.

The most important insect pest is the Mexican Cotton Boll weevil (*Anthonomus graudis*) which causes immense damage and is spreading fast at the rate of 70 miles per annum. The only way to avoid it is by planting an early maturing crop. The cotton worm or army worm (*Aletia argillacea*) eats the leaves. The remedy is to spray with arsenate of lead. Anthracnose (*Collectotrichum gossypii*) fungus starts with a black spot on the boll which it gradually rots away.

The Boll worm does not do much damage.

AMERICAN COTTON FOR INDIA.

It is considered possible to cultivate the upland cotton in India in a similar way to what it is grown in America, provided there is rain at planting time, good cultivation, and the planting not done too close: 3 to 4 ft. apart between the rows is advised. Light sandy and alkali lands are not suitable.

If grown under irrigation the following plan may be adopted: After a first irrigation, rows 3′ apart should run across the field with a native plough. Just after the plough should go the sower dropping the seed at the rate of 30 lbs. per acre. This gives a moist seed bed. After the plants are up, the land

between the rows should be ploughed occasionally. This is cheaper than hand-hoeing, and the native plough does not go deep enough to do any damage. Excess of plants in the rows should be cut out. The difficulty in the East is to get the cotton picked clean. In a hot dry atmosphere dust and broken leaves are hard to keep out.—(Summarised from the *Agricultural Journal of India.*)

ROOT DISEASE OF HEVEA.

FUNGUS PARASITES.

Since 1907, practically no additions have been made to the list of fungi parasitic on Hevea in the East; and this state of affairs has afforded the opportunity, where few other cultivated products demanded attention, for a more intensive study of its known diseases. A recent Bulletin, by Bancroft, the chief of the mycological division of the F.M.S. Department of Agriculture, on the common root disease caused by *Fomes semitostus*, goes more deeply into the matter than any previous publication, and includes the results of several experiments on the spread of the mycelium, as well as numerous observations on the action of the fungus on the plant, its relation to *Termes gestroi*, and the methods of treatment. This, and other recent Bulletins, show a marked advance in mycological work in Malaya, and its planters are to be congratulated upon the acquisition of a mycological branch commensurate with the importance of their industry.

Bancroft states that the effects of the fungus have been more severely felt on the low-lying alluvial land because its

SPREAD IS MORE ACTIVE UNDER DAMP CONDITIONS.

But he notes that its distribution through the country generally is irregular and cannot be explained by differences in soil or elevation. "It is by no means unusual to find on one estate a death rate of 12 per cent. of trees during the first few years of cultivation while its immediate neighbour, possessing similar soil and opened up from similar jungle will yield only 2 per cent. of cases of the disease during the first three or four years of cultivation.

WHITE-ANT ATTACKS AND ROOT DISEASES.

The correct apportionment of the damage between white ants and root disease has long been a matter of debate. In Ceylon it has always been held that when white ants attack *Hevea* roots they follow a previous attack of root disease in the case of established trees, and of *Botryodiplodia* in the case of failure of "stumps." But Ceylon does not harbour *Termes gestroi*, and consequently it has been recognised that conditions in Malaya were different. On this point Bancroft writers :—

"The tap root is sometimes rapidly destroyed by *Termes gestroi* following on the attack of the fungus. Both *Termes gestroi* and the fungus are frequently associated with each other on the roots of *Hevea*; the

INSECT IS FAR MORE RAPID IN ITS ACTION THAN THE FUNGUS,

and for this reason the destruction of trees is often attributed to the insect when there is good reason to believe that they were first attacked by the fungus. In the majority of cases in which both the root fungus and white ants are found attacking trees of *Hevea* the initial attack is due to the fungus; and it would appear to be likely that trees which are affected by the root disease are more susceptible to attacks from white ants. Trees which are primarily attacked by the fungus and subsequently by white ants may in the later stages of disease show no signs of fungus attack owing to the disappearance of the strands of mycelium. Such cases are invariably diagnosed as being due to white ants only; and, on the whole it would appear that a large proportion of the damage which is attributed to white ants, more particularly among older trees, is initiated by the root fungus. In young clearings, on the other hand, many trees are attacked by white ants without any intervention on the part of the fungus." It would seem that conditions in Malaya

are not so very different from those in Ceylon after all. But the difficulty is that to the planter all "white ants" are the same.

RESULTS OF OBSERVATIONS.

Observations with regard to the spread of the mycelium are summarised as follows:—

"(1.) The mycelium of the fungus appears to show no appreciable capacity for resting in the soil when its normal source of food supply has been removed; when the growing mycelium is unable to come into contact with living or dead roots or when the soil containing the mycelium is cleaned of roots and timber, the mycelium soon dies out.

(2.) The disease can be spread by the growth of the mycelium from infected to healthy roots; the mycelium occurs on the roots of dead jungle trees which thus provide a source of infection in the planted area. The mycelium grows most rapidly where the material is dying or but recently dead, and the danger of infection is greatest where there is an abundance of such material in the land, *i.e.*, immediately after the jungle has been felled and burnt.

(3.) Damp conditions favour the growth of the mycelium.

(4.) The mycelium occurs in greater quantity in the uppermost eighteen inches of the soil, but it can occur at greater depths and has been recorded at a distance of three and a half feet below the surface of the ground.

(5.) The disease makes its appearance usually at the end of a year or eighteen months after the area has been planted. The fungus can, however, infect younger plants, and it has been found that infected plants have sometimes been transferred from the nursery to the field.

(6.) The disease can be reproduced artificially by the growth of strands of mycelium from infected to healthy roots, which is concluded to be the usual mode of infection in the field.

(7.) The time-rate of death of the plant from the disease is not easy to determine accurately; but such observations as have been made tend to show that plants of one or two years of age succumb to the disease usually within four to eight months after they are attacked. Older plants may live on for a longer time. It is estimated for old trees that two years may elapse before they succumb to the disease."

RECOMMENDATIONS.

Bancroft recommends that a trench, two and a half feet deep should be dug round an infected area. When a single tree dies from the root disease the trench should in most cases include not only the dead tree but the eight trees adjacent to it. The lateral roots of these surrounding trees should be examined, and cut off if found diseased. All dead wood must be dug out from the area isolated and burnt on the spot. When the area enclosed has been dug over once, it is advisable to dig over a second time at an interval of about a month and to turn in lime at the rate of 25 lbs. for every 100 sq. feet. "The time of 'supplying' depends upon whether the dead wood has been properly removed or not. It has been found that where the infected areas have been dug over a second time and limed and the work has been carefully done the 'supplies' can be put in within a few weeks." "Generally speaking, supplying is done up to the sixth or seventh year."

On the question of

REMOVING ALL TIMBER

from *Hevea* plantations, Bancroft's views are somewhat at variance with the current policy of indiscriminate removal of everything. On this point anyone interested in Malayan plantations should consult the Bulletin for the full evidence on which the author's views are based. "There appears to be sufficient evidence to show that the disease can be successfully eradicated if careful attention is paid to the treatment of the infected areas or centres of infection, although the bulk of the timber be allowed to remain.

THE COMPLETE REMOVAL OF TIMBER from the land would appear in most

cases to be extravagant. It is important, however, if the timber be allowed to remain on the land, that the cases of disease should be properly treated as soon as they are located. There are some cases in which the land should be cleared of as much timber as possible. There have been some instances on the lowlying land in which the disease was not treated in the early years of cultivation, and consequently a number of older trees continue to develop the root disease; in such cases

THE INFECTED AREAS ARE DIFFICULT TO LOCATE,

and the land should be cleared of timber and properly drained. Again, in the opening up of swampy land, where the fungus is abundant and the conditions are favourable to its spread, the land should be cleared of timber and properly drained from the outset. Such cases which would appear to warrant the outlay of expenditure necessary for the complete removal of timber are, however, exceptional." The difficulty here is that the Superintendent and the Visiting Agent demand a universal rule, and that it requires a knowledge of mycology to discriminate in the matter.

Only on one point do we find a difficulty in agreeing with the author, and that is on the question of the

JUNGLE TREES WHOSE STUMPS AFFORD A STARTING POINT

for *Fomes semitostus*. In Ceylon, this fungus has been found on Jak (*Artocarpus integrifolia*), the red cotton tree (*Bombax malabaricum*), *Ficus* spp, and ? *Derris dalbergiodes*. That shows a fairly wide range, botanically considered. In Malaya, however, it has been recorded on meranti (*Shorea* sp.), merabau (*Afzelia* sp.), Kumpus (*Koompassia malaccensis*), nibong (*Oncosperma filamentosa*), Liberian coffee, Robusta coffee, Tapioca, Bamboo and Formosan camphor, records which exhibit a range from one end of the flowering plant world to the other. However, there is nothing exceptional in that since other fungi are known to be equally catholic in their tastes; *Fomes lucidus*, for example, is a parasite on palms, bamboos, mango trees and flamboyants. Therefore, since *Fomes semitostus* is more abundant in Malaya, it would seem that it can develop on any kind of stump. But there still lingers a doubt, one which I may venture to express, as it is

BASED ON THE EXPERIENCE OF SEVEN YEARS' FUNGUS HUNTING

in the Tropics. There are two tropical fungi, quite commonly represented in botanical museums, which are almost indistinguishable when dry. One of these is our *Fomes semitostus*, and the other *Polyporus zonalis* Berk. Mr. C. G. Lloyd who is making a more thorough study of this group than has ever before been attempted, showed me the specimens of these two at Kew and stated that he could find very little difference between them; and in a recent letter, acknowledging the receipt of specimens of both, he writes, "While you tell me they are quite different when fresh I have trouble to distinguish them always from the dried specimens I receive." They are fairly easily distinguishable when fresh. *Polyporus zonalis* is never so red-brown as *Fomes semitostus*, nor is its margin so yellow, and, in addition to the concentric grooves which occur on both, the former frequently bears radial grooves also. Internally they are alike, but while *Fomes semitostus* is orange below, *Polyporus zonalis* is a peculiar livid greyish colour; this latter feature decides its identity immediately, but it is not evident except on fresh specimens. Now, *Polyporus zonalis* is common everywhere, but only saprophytic. I have found it in a rubbish heap developing its fructification on stones; and it is very common on dead palms and bamboos. The idea which suggests itself on perusing the records of *Fomes semitostus* is that some of them may refer, not to that species, but to the common saprophyte, *Polyporus zonalis*. I have not yet met with the former on palms or bamboos in Ceylon.

FOMES SEMITOSTUS VS. POLYPORUS LIGNOSUS.

A further point may be noted, to complete our knowledge of the common

Hevea root disease, though it is of interest to the mycologist rather than to the botanist. The name *Fomes semitostus* was bestowed by Berkeley on a fungus collected in Northern India. In 1898, it was recorded for Singapore among a parcel of fungi sent to Kew by Ridley. In 1904 Ridley reported to the occurrence of a root disease on *Hevea* at Singapore which he ascribed to *Fomes semitostus*. Bancroft states that the fructification was identified by Massee at Kew as *Fomes semitostus*. That view was taken in Ceylon when the disease was discovered here in 1905, and as the fungus was identical with that in Singapore, the name of *Fomes semitostus* was adopted. But on enquiry at Kew last year, all knowledge of Ridley's fungus on *Hevea* was disclaimed. It now proves, as has been previously hinted, that the Singapore identification was incorrect; and according to Lloyd, the common root disease fungus of *Hevea* should be known, not as *Fomes semitostus*, but as *Polyporus lignosus*, a name which was given to it by Klotzsch. It is quite a different fungus from that which was named *Fomes semitostus* by Berkeley.

T. PETCH.

CARDAMOM CULTIVATION.

The cultivation, curing and commerce of cardamom is the subject of an exhaustive paper in the *Chemist and Druggist* of March 9th last. It contains a very full account of cardamom culture as carried on in Ceylon—from which we take the following notes:

It is in Ceylon that the cultivation of cardamom has been raised to a fine art, with consequent improvement in the quality of the product. About 1884, when the price of the spice ruled high, cardamom-growing was tried in nearly every Ceylon Plantation. Remarkable success was met with in some instances, yields of 200 lb. to 300 lb. per acre being obtained. The acreage under cultivation increased until 1902, after which year low prices led to a reaction. The favourite cardamom districts of Ceylon are Matale (1474), Medamahanuwara (1499), and Hewaheta (395). The figures in parenthesis relate to the acreage under cultivation in 1910, when 7,426 acres of land of the value of 445,560*l*. was given over in Ceylon to cardamom cultivation.

CULTIVATION.

Portions of the forest lands or sheltered moist hollows in plantations are selected. Sufficient vegetation is left, to give a chequered shade with light and air. Holes 1½ ft. to 2 ft. wide and 12 in. to 15 in. deep are dug 7 feet apart in rows at a similar distance. The best bulbs to plant are double ones, consisting of two stems connected together.

The use of seedlings instead of bulbs is growing. The seeds which are obtained from fully ripe fruit are dried by a short exposure to the sun, and steeped in water for a few hours before growing in the nursery bed. The Mysore variety is the most easily grown from seed, but apparently only a small proportion germinates. Planting can be done at any time when there is no dry spell of weather. The seedlings will produce a maiden crop in three years.

PICKING.

In Ceylon the plants flower almost all the year round, but principally in January to May. Picking begins end of August and continues until April, October to December yielding most fruit. In India the wasteful method of pulling off whole racemes is followed, but in Ceylon careful attention is given to picking. The capsules are cut before they ripen, the slight turn of colour to yellow and the firmness of the fruit being the indications. An average daily picking is 10 lb.

CURING

is effected in dry weather by exposure to the sun. Three hours exposure in the morning and two in the afternoon are sufficient. In wet weather slow drying is effected by gentle artificial heat on trays contained in racks in the curing-house, but the product is more brown in colour and accordingly less valuable.

CLIPPING AND GRADING.

The capsule still bears the remains of the calyx tube at the apex and the stalk at the base, and these have to be removed by a hand machine. The grading of the fruit is effected by small sieves into "longs," "mediums," "shorts," and "tiny." After sizing, the fruit is sulphured by placing in trays over burning sulphur.

VARIETIES.

As indicated above, plump Ceylon—Mysores are the type of cardamoms most approved in this country. These vary from ¼ to ¾ in weight the smaller being ovoid, the larger angular in shape.

The wild Ceylon cardamom is the largest variety sometimes attaining 1½ in. in length. It usually possesses a dark brown and coarsely striated shell, the sides of the pod being sunken and the angles sharp. Malabar cardamoms are exported both from Ceylon and India. The shell of this cardamom is generally brown and striated. The Alleppy are very similar in type to the Malabars, but are larger and appear both as bleached and unbleached, the latter retaining a peculiar green colour. A round type of cardamom known as Ceylon Mangalores sometimes arrives in the London market. This kind fetches good prices. Decorticated seed obtained from over-ripe fruit is also an article of commerce.

USES.

The principal uses of cardamoms are as a flavouring agent in curries and cakes, and in medicines as compound tincture of cardamoms. Russia, Sweden, Norway, and parts of Germany are the European countries which are most fond of the spice for culinary purposes. Ceylon cardamoms are also used in the manufacture of liqueurs. In India they are used coated with sugar at festivals, and for chewing with betel, as well as for a condiment and in medicine.

COMMERCIAL.

The acreage, which in 1903 reached the maximum of 9,500 acres, went down to 7,300 in 1911 while the highest price which was 9s. 1d. in 1880 was 2s 11d last year.

Less attention is being given to cardamoms since the rise of the rubber industry. The United Kingdom last year received about 40 per cent. of the total exports from Ceylon. Germany was the second best customer, after which followed India, her imports last year showing a considerable decline as compared with the previous three years. The United States imports more than doubled, and Turkey also shows a big increase. Scandinavia has also come forward as a buyer on a larger scale.

The exports from India during the following years ending March 31 were:—

To	1905-6 lb.	1906-7 lb.	1907-8 lb.	1908-9 lb.	1909-10 lb.
United Kingdom	71,206	55,085	20,790	81,807	145,749
Germany	17,753	16,433	4,880	13,794	39,622
Egypt	13,347	14,849	18,405	23,765	22,620
Aden	32,155	26,668	24,361	21,392	23,884
Arabia, Muscat or Oman	43,510	13,949	12,791	5,734	10,525
„ Other Native States	58,457	40,469	7,790	1,092	168
Ceylon	10,558	2,858	7,236	112	41,020
Persia	14,046	3,579	12,268	33,289	21,406
Turkey, Asiatic Ports in the Red Sea and Persian Gulf	14,208	3,268	63,703	57,674	69,181
Other Countries	20,150	25,216	28,464	20,766	31,819
	259,390	202,374	200,688	259,425	405,994

The exports from India for the year 1910 was 405,994 lbs, against Ceylon 639,000 which in 1911 fell to 564,819 lbs.

The values were respectively 19,834*l*., 14,611*l*., 15,437*l*., 20,278*l*., and 30,503*l*.

One of the most important districts in Ceylon is Matale, and at the last annual general meeting of the local Planters' Association, held on January 27, 1912, it was reported that the crop in that district was about four-fifths that of the previous year. This was owing to the drought which prevailed from January to June also during August, when many of the racemes died, and where they did survive blossoms failed to fructify. The short crops generally with diminishing stocks in London and other markets, caused prices to rise on all grades, the increase at date (January) being 9d. per lb. with an upward tendency. Although prospects have improved lately, the total shipments during 1912 will, in the opinion of growers, not exceed the 1911 crop, as several of the older cardamom fields are ceasing to bear a paying crop and will be planted up with tea. There are very few young clearings (the report states) coming into bearing to maintain the quantity. One of the features of the London drug-market this year has been the remarkable falling-off in the quantity of cardamoms offered at the fortnightly auctions. This is, of course, due to the paucity of arrivals from Ceylon, from whence we have only received 3,593 lb. from January 1 to February 5, which is 16,076 lb. less than at the same date of last year. Altogether, the exports from the island for this period were 22,495 lb. as against 49.005 lb., or 26,510 lb. less. It is surprising that Germany has already received direct this year 11,043 lb., which is a contrast as compared with the U.K. figures. India has only taken 4,348 lb. this year, as against 10,527 lb. Norway and Sweden have come forward as bigger consumers with imports of 1,042 lb., but the United States has not shown much activity as yet. As a rule the offerings of cardamoms at auction forms one of the staples, and the market is keenly followed by the agents for Continental and American buyers. Not long ago the cultivation was a very acceptable by-product to tea-planters and was a source of additional profit. In fact, at one period the trade in cardamoms was so considerable that the Indian spice had to give way to Ceylon, which swamped the markets to such an extent that prices ceased to pay. This was about 1903 and 1904, when 2*s.* 6*d.* per lb. was the top price paid in London during the mid-season, exports at that time approaching nearly 1,000,000 lb. Now it would appear that cardamoms are giving way to rubber cultivation, and the output last year was the lowest for the past decade.

In 1905 a Cardamom Cess Committee was formed in Kandy, Ceylon, to increase consumption of the spice and find new markets. With this object the planters, with Government aid, instituted an export tax of 1c. per lb., and with the money raised commissioners visited the various centres, including London, Hamburg, Bremen, Leipsic and other German towns; also Russia and Australia. It cannot be said that there has been any definite expansion in consumption of the spice as the result of their efforts.

The annual report of the Planters Association states that the crop shipped, 564,819 lb., during 1911 included a large share of the previous year's harvest and the early spring gatherings. With a favourable season, the present estimate of cardamoms for 1912 is 560,000 lb. only as several of the older fields have ceased to bear paying crops and are being planted with tea, while the new acreage coming into bearing is very small. A cess of 1c. per lb. on all cardamoms shipped from Ceylon during 1911 was suggested by the Cess Committee for the purpose of continuing advertising. The proposition met with a fair amount of promised support, but not sufficient to carry on the advertising considered desirable.

THE CULTIVATION AND COMMERCE OF CARDAMOMS.

In this article the cultivation, curing, and commerce of Cardamoms are described. The photographs were expressly taken for "The Chemist and Druggist" by Mr. H. F. Macmillan, of Peradeniya Botanic Gardens.

Ceylon.

"Pharmacographia" traces the first mention of cardamoms to Susruta, and accordingly considers that the drug may have been used in India from a remote period, not unlikely reaching Europe, like ginger and pepper, in classical times. Edrisi *circa* 1154 notes cardamoms as a product of Ceylon, but the Portuguese navigator Barbosa (1514) was the first to designate correctly the country of origin as the Malabar coast. Cardamoms grow chiefly in Ceylon and Southern India, China, Siam, and the Malay Archipelago generally, as well as in Madagascar and West Africa, but the first two only are of importance as regards European commerce. China cardamoms were described by Daniel Hanbury in 1855, since when practically nothing has been added. The Siam spice, derived from *Amomum Cardamomum*, L., found its way into the Pharamacopœas of the early part of the seventeenth century as *Amomum verum*, but by the end of the century it became a rare drug, and later disappeared. In 1857, after commercial relations reopened with Siam, forty-three bags from Bangkok offered at the London drug-auctions failed to find a purchaser, the buying-in price being 1*s.* 6*d.* The Nepal cardamom, which was sent all over India three-hundred years ago as to-day, the Bengal cardamom, the "wild or bastard" cardamom of Siam and the Java cardamom are derived from various species of Amomum, and, although some form a considerable article of trade in the East these types of cardamoms do not now arrive on the London market.

Botany.

The cardamoms of British commerce are derived from *Elettaria Cardamomum*, which grows wild, or is cultivated, on the Malabar Coast of India and in Ceylon, these countries providing almost exclusively the fine grades met with on the London markets. The annual consumption in India and Burma is computed to be nearly one million pounds. There is a large market for the spice in Calcutta, the Cardamom coated with sugar forming a feature at Hindoo festivals and ceremonials.

The Malabar cardamom-plant formerly yielded the bulk of the spice imported into this country, but the cultivated Mysore variety now affords most of the fine quality. The latter plant possesses a more robust habit, having larger and coarser leaves of deeper colour and bearing exposure better than the Malabar type. The most noticeable difference is the inflorescences which spring almost vertically from the bulb of the Mysore variety, but spread along the surface of the soil in the Malabar description. It is not known how the district name "Mysore" came to designate the variety of a cardamom plant. There is, however, much confusion regarding the equivalents in India of these two cultivated types, some holding that the names are reversed in India. There also appear to be two varieties of Malabar plants var. *minus* being confined to Southern India and var. *majus* growing in Ceylon. The latter is distinguised by its shorter stems, broader leaves, and less globose fruits.

The reed-like nature of the true or lessor cardamom-plant is evident from figure 1* which shows a complete young plant of the cultivated Mysore variety. The short-branched rhizome is creamy white in colour, with deep pink markings. In the illustration a bulb bearing two ærial stems is shown, one of which is folded to give some idea of its length by comparison with a scale (the smallest section of which is equivalent to 1 in.). The lance-head shaped leaves vary from 1 to 3 ft. in length and are from 3 to 6 in. wide, while their bases are sheathing. Below the stem on the left are seen two adventitious buds, which would have produced new aerial stems. The flowers are borne in loose inflorescences (racemes) on stalks some 16 to 18 in long, which grow out close to the ground, being usually thrown out in the full-grown plant in groups of four to each aerial stem. Each raceme may have eight to fourteen branches each with three to six flowers. The green calyx tube of the flower is 1½ in. long. The pale green corolla lobes are half an inch long,

* Not produced.

and bearing violet purple streaks radiate from the centre. The fruits which ripen successively, are also shown. They are three celled, each cell containing several aromatic seeds. They open by three valves when ripe. The seeds are irregularly angular and transversely wrinkled. The fully grown plants frequently attain a height of 15 ft. or more.

Figure 2 (not reporduced—ED.) shows the more slender native wild cardamom of Ceylon (*Elettarir Cardamomum*, var. *B major*) in a fruiting condition. Compare the size and number of fruits with fig. 1. Cardamom plants growing in the Peradeniya Gardens, Ceylon, are shown in fig. 3.

CULTIVATION.

In India the home of cardamoms is the western slopes of the mountains of the Malabar coast, where there is a mean rainfall of 121 in. and a mean temperature of 72° F. The plant, which revels in moist localities, is commonly met growing wild in the wet shady mountain-forests of Canara, Cochin, and Travancore, being indigenous between the altitude of 2,500 to 5,000 ft. The wild plant bears but short inflorescences, which become only sparsely fruited. In the States of Cochin and Travancore freer development is allowed by cutting and burning the brushwood of the jungle, while in the Coorg forests the natives practise a more systematic kind of cultivation as given below. The cultivation of the plant in the forests of the Anamalais, the Pulneys, and the Wynaad facing the Malabar coast is also in the hands of natives and of an indifferent character. The cardamom plant is best suited to rich loamy soil, which is kept moist (but not wet) at all seasons, and is protected from strong winds. These conditions are met with in the betel-nut plantations or pepper-gardens of Mysore and of Canara, as also in the cultivated cardmom valleys of Ceylon. The plant will grow luxuriantly on stiff clayey soil, but it produces but little or no fruit under these conditions. At the best the plant is capricious in regard to fruiting.

In Coorg the Forest Department leases plots for fourteen to twenty-one years, and here the simplest of the effective modes of cultivation is followed. In February or March the cultivators set out for the shady evergreen forests and mountain sides, and begin to make small clearings of about a square chain in extent, there being about four to an acre. A space of some 20 to 30 yds. of jungle is left between each garden. Half the party cut down the small trees and brushwood—the remainder felling the large trees. Selection of a suitable site is aided by the presence of seedling growths of cardamoms, but tradition and superstition also play a part. For instance, the presence of such plants as ebony, nutmeg, or pepper is held to be highly favourable. Felling of trees for shaking the ground must be done on certain days of the week, and be completed before noon. A party of ten men can, on an average, make five gardens a day, and generally some fifty or hundred gardens are made annually until the whole jungle is under cultivation. Too many gardens lead to an injurious decrease in the amount of available moisture. Following the early rains of the monsoon, the dormant seeds germinate, and young plants shoot up on all sides of the clearing, especially near the roots and stem of the fallen tree. The native is not sure how the plant makes its sudden appearance, but he has general belief that the seed is spread by monkeys, rats, and snakes. By the end of a year the plants are 2 ft. high. and weeding is then begun, a space of 6 feet being cleared around each plant, and weaklings pulled up. Considerable care is exercised in deciding which plants are superfluous. Little weeding is needed in subsequent years, as nothing will grow in the shade of the plant. By September or October of the third year a light crop is produced which is the "Devakottu" (God's fruit) of the Coorgs, a portion being ceremoniously offered to the deity. Each rhizome will then have about eight stems, but the full-grown plant often has twenty aerial shoots. A partial harvest is obtained the fourth

year, after which full crops are then produced for six or seven years, when the plants become sickly, and commence to decay. Then in February some large trees are felled across the plot, killing many of the aerial stems, and stimulating the rhizomes to produce new adventitious shoots, thereby renewing the producing capacity of the plot for another eight years, when the process of renovation is repeated.

In South Mysore the forest cultivation is carried on by a departmental agency in the Nassau district and in the Ghat forests the Coorg system is being followed, and blank spaces filled with young plants from bulbs. Two large cardamom planters (Messrs. Middleton and Brooke Mockett) store their clearings with nursery-raised seedlings in "stools" about 7 feet apart. The Mysore Conservator considers that with this system the risk of interference with rainfall is increased.

In Kanara the cultivation carried on in the betel and pepper gardens of the Sirsi and Siddapur talukas is from seedlings, bulbs, and cuttings, being also used for propagation in the old gardens. They are usually planted in "stools" alternately with the betel-palms.

THE TIMBER INDUSTRY OF THE DUTCH NETHERLANDS.

Mr. J. V. de Coque, an authority on timber, contributes a paper on the "Forest Wealth of the Netherlands East Indies" to the "*Tijdschrift Voor Nijverheid En Landbouw In Nederlandsch—Indie,*" in which he deprecates the lack of enterprise on the part of the authorities responsible for the exploiting of the local timber trade.

It would appear that the forest officials have given their attention solely to teak (which is acknowledged to be the most valuable timber known to commerce for general structural purposes) to the exclusion of other forest timbers, which are unfortunately and erroneously termed "wild timber" though they comprise many good woods.

TEAK GETTING SCARCE.

Teak is now, however, becoming scarce and has naturally increased in value: and this has influenced the British Indian Forest Department to adopt a strong policy for keeping up the supply by regular replanting and other conservancy measures.

THE NEW SOUTH WALES GOVERNMENT

had a similar problem to face some years ago in connection with the exportation of their two most valuable timbers, viz: *Eucalyptus paniculata* (iron bark), and *Eucalyptus microcorys* (tallow-wood) chiefly for sleepers. The result both in the case of Java and New South Wales is that the estimates for public works and railways show a considerable annual increase.

In the case of the Australian colony referred to, the Government met the difficulty of imposing a heavy export duty which turned the attention of European buyers to other species of Eucalyptus: and Mr. de Coque suggests that similar measures should be adopted in Java, and the authorities made to realise the forest wealth of Sumatra, Borneo, the Celebes and the other islands of the archipelago, with their

THOUSANDS OF SQUARE MILES OF VALUABLE VIRGIN FORESTS

hitherto referred to as "wild woods," —a term suggestive of inferior material,— and bring them within the reach of the markets of Europe, which are always craving for fresh supplies of timber.

As a substitute for teak, Mr. de Coque recommends *Statis sidcroxylon* (Tempenis) and *Parinirium oblongifolium* (Balau) both suitable for sleepers and general building work. He also mentions the local "iron-wood" (but this common term conveys no definite idea to what he refers) and other useful trees called by their local names and therefore not identifiable.

AGRICULTURE IN THE LEEWARD ISLANDS, 1910-11.

The year 1910-11 may, on the whole, be said to have marked a period of considerable progress and activity in agricultural matters.

SUGAR.

Sugar cultivation is the largest and most important of the agricultural industries of the Colony and constitutes the principal source of revenue in Antigua and St. Kitts. In both Presidencies the year 1910-11 may be said to have been fairly propitious for sugar cultivation.

The sugar export of Antigua during the year amounted to 13,488 tons of which 6,397 tons were 96° grey crystal sugar and 7,091 tons muscovado. The central sugar factory at Gunthorpes manufactured 5,400 tons of crystals, taking 8·95 tons of cane to make one ton of sugar while the Bendals Factory was responsible for 1,015 tons of crystals.

The export from St. Kitts amounted to 12,330 tons, consisting almost entirely of muscovado sugar.

At the present time, the sugar industry of Antigua is somewhat severely handicapped by the wide-spread prevalence of root disease of sugar-cane (*Marasmius sacchari*). The disease is somewhat difficult of recognition, especially as its intensity is greatly affected by external conditions. The importance of the disease as a controlling factor in sugar-cane cultivation is gaining in appreciation, but it is only where it is completely recognized that remedial measures can be applied with real prospects of success.

PEASANT CANES

have continued to be purchased at the Gunthorpes and Bendals factories in Antigua. During the year the former purchased 3,542 tons, and the latter 4,176 tons of peasants' canes. There is no doubt that the provision of an adequate market for peasant-grown cane has had a considerable effect in improving the position of the peasantry in Antigua.

COTTON.

The year may, on the whole, be said to have been distinctly satisfactory as regards the cotton industry. As the outcome of the favourable results obtained in the previous year, considerable increases in the area planted under the crop occurred in all the Presidencies.

Moderately favourable weather was on the whole experienced and satisfactory yields were almost everywhere obtained. A notable feature of the season was the

RELATIVELY SMALL PREVALENCE OF INSECT PESTS.

Prices declined somewhat from the high value of those in the previous year, and during the earlier months of 1911, owing to trade depression in England, the product was difficult of sale. At the time of writing the bulk of the crop has been disposed of at fairly satisfactory prices.

THE CULTIVATION OF LIMES CONTINUES to occupy the position of principal agricultural industry in Dominica, and further expansion has once again to be recorded. The crop for the year was 369,000 barrels, an increase of 85,000 barrels over the crop of 1909. This remarkable increase is partly attributable to the coming into bearing of young plantations established within recent years. Considerable efforts continue to be made by the Permanent Exhibition Committee of Dominica to popularize limes in England and Canada by means of judicious advertisement and representation at exhibitions. The export of citrate of lime amounted to 5,194 cwt. valued at £16,880; this showed an increase of 1,747 cwt. over the export of 1909.

In Montserrat, the total exports of lime products were valued at £9,000. Trouble continued to be experienced in connexion with scale insect pests.

In Antigua interest in the crop continues to grow, and considerable increases are being made in the area planted under the crop, especially in the southern district of the island. In Nevis also interest in the crop continues to

grow, while in the Virgin Islands attempts are being made to foster the growth of a small industry.

CACAO.

In Dominica the cacao crop amounted to 11,012 cwt, valued at £23,769, a small increase over the exports of the previous year. Small exports of cacao were again made from Montserrat.

Interest continues in the possibility of cacao production in suitable localities in St. Kitts and Nevis. The plantations are small in area; that in St. Kitts has been slightly extended, but the total amount of land suitable for this form of cultivation is relatively small.

RUBBER-GROWING

is now attracting considerable attention in Dominica. Trials have shown that the Para rubber tree (*Hevea Brasiliensis*) grows well under the conditions obtaining in many localities; an appreciable area has already been established under the crop, and this is being considerably extended. It is hoped that this form of cultivation may prove especially suitable to the conditions obtaining in the interior lands of the island.

THE CULTIVATION OF COCONUTS

continues to attract attention in Antigua and Nevis. About 200 acres have already been established under the crop in each of these Islands, and the area is being extended. The older trees present a promising appearance, especially in Nevis, where they are now coming into bearing. Should these pioneer plantations prove financially successful, it appears probable that they may lead to considerable further developments in this direction in the future, as the Colony possesses considerable areas of land at present in waste, which appear likely to be well adapted to this form of cultivation.

VANILLA.

The possibilities of vanilla cultivation on a systematic basis are now engaging some attention in Nevis and Dominica, and small trial plantations have been established; the development of these attempts will be watched with interest.

Onion cultivation for export continues to be carried on with success as a small industry in Antigua. The onions are chiefly grown as a catch crop on land prepared for cane planting. In the other islands onions are raised in small quantities, chiefly for domestic use. (From *Colonial Reports*—Annual No. 711, p. 10.)

EFFECTS OF DIFFERENT PROPORTIONS OF LIME AND MAGNESIA IN SOME SOILS.

An account of a large number of experiments dealing with this matter, conducted during 1907, 1908 and 1909 on six different types of soil and with eight different crops receives attention in the *Experiment Station Record* for December 1911, p. 725.

As regards the yield from the plants grown, it was found that, even when the proportions between the lime and magnesia were varied largely, there was no effect on the return. Thus the investigations did not give support to Loew's supposition that the power of plants to produce crops depends in a very definite way on the ratio between the amounts of lime and magnesia in the soil. It may be stated, in passing, that information concerning this theory, and details of other matters connected with it, may be found in the *Agricultural News*, Vols. IX, p. 95 and X, pp. 60 and 328.

THE BEHAVIOUR OF PLANTS TOWARD LIME AND MAGNESIA

varied with the kind of plant, and even when these substances were added to soils containing very small amounts of them, no increase in yield was obtained so that the conclusion is reached that the same plants must be studied in the same soil for several consecutive years before definite results can be gained. Another interesting conclusion of a general nature was to the effect that, although substantially the same yields may be obtained from plants on different occasions, the amounts of lime, magnesia and phosphoric acid contained in them may vary greatly.

With respect to matters that are of more isolated importance it was found that the

USEFULNESS OF LIME IN GROWING MUSTARD

is dependent on other factors, in addition to the nutritive value of that substance. Again, the observation was made that the lime content of grain is much smaller than that of straw, there is more magnesia than lime in the former while the opposite condition obtains in regard to straw. Further, the composition of straw is more susceptible to changes in the amounts of lime and magnesia than is that of grain.

When the manures applied were rich in magnesia and poor in lime, the lime content of the crop was lowered, while there was an increase in its content of magnesia and phosphoric acid. In determining the exact relation of lime and magnesia in the soil, the varying solubility and absorption of the manures supplying them must be considered.

A last matter of more general interest is that, as with the higher plants, no distinct proportion of lime to magnesia, which was particularly favourable to development in the case of bacteria, was found.

RUBBER IN BRAZIL.

EXTENSION OF THE AREA UNDER PLANTATION RUBBER.

The new railway which Brazil is constructing around the falls of the Madeira and Mamore Rivers will open up an immense new field to the rubber collectors, the *Philippine Agricultural Review* tells us. This new road enters the "buffer state" of Acre, which was for some time a disputed territory between Bolivia and Brazil. It will probably be open for traffic by the middle of 1912, and it is expected that it will not only increase Brazil's output of wild rubber by some 20 or 30 per cent., but will also give the rubber district of Bolivia a new direct outlet by rail instead of over the extremely dangerous rapids of the aforesaid rivers as heretofore. This will, of course, be a strong factor in the gradual if not rapid reduction of the price to the problematical

"ROCK BOTTOM RATE OF 2S. PER LB."

Meanwhile the encouragement held out by the Government for the planting of rubber in the State of Pará has already resulted in the setting out of many thousands of Para trees. During the next four years it is estimated that some six million trees will be in evidence in modern plantations.—*Tropical Life.*

CACAO CULTIVATION, NO. XXVII.

THE QUESTION OF TILLAGE ON CACAO ESTATES.

In the book on "Coconut Cultivation," to be issued by our publishing department, special attention has been devoted to the necessity of cultivating the land between the trees for the benefit of the crop. Many of the older generation of coconut planters, partly perhaps because they have planted their trees close together, have been against this tillage between the palms, claiming that its adoption did more harm than good; modern ideas, however, point the other way.

If, however, the passing generation was against cultivating the land, and possibly

DISTURBING THE ROOTS BETWEEN

coconut palms, the prejudice that has always existed, and still exists, against doing so between cacao trees is many times stronger. In spite of this those who have seen and studied the discussions published in the December (1911) issue of the *Proceedings of the Trinidad Agricultural Society* will realise how important and useful a certain degree of cultivation between cacao trees is, if the trees are to keep their leaves and pods during periods of drought. The principles of dry farming, with which we dealt last month, so far as the conservation of moisture in the soil is concerned, need to be practised just as much on a cacao estate when drought is about and the trees are suffering from lack of

moisture as in recognized "dry" districts.

EXCESSIVE SHEDDING OF LEAVES

from cacao trees not only betokens a state of affairs immediately harmful to the tree and the pods, large or small, that it is bearing at the time, but it is an ill omen for the success of the pods still to come, as the Trinidad planters can tell you regarding the prospects of restricted picking with which they are now faced. If it is not the shedding of the leaves that is the trouble, it is that which causes the leaves and young pods to part company with the trees that causes, or should cause, anxiety to the planter; and as this anxiety can be avoided to a considerable degree, if not entirely, we will call attention to some means of combating the trouble. Whilst the matter is fairly and fully discussed in the *Proceedings of the Trinidad Agricultural Society* already referred to, we still think it best to call our readers' attention to some of the

CHIEF POINTS RAISED BY THE VARIOUS AUTHORITIES.

The numbers in parentheses refer to the different opinions quoted by various authorities in the report. We quote as printed :—

(1) The shedding of leaves out of season is intimately connected with a reduction in precipitation. This is an admitted fact, established by observations extending through many years. The quantity of rainfall is, to a large extent, beyond control, but the effects of any given amount of rainfall may be regulated. Cultural methods tending to the

PRESERVATION OF MOISTURE DURING DRY SPELLS

would probably do much towards reducing out-of-season leaf changes. . . . Manuring would also tend to ameliorate conditions during such periods, especially mulching, and stable or pen manure well mixed with straw, or other bedding material.* Manures rich in undecomposed vegetable matter convey a certain amount of moisture to the soil, and serve also to retain that which is already present in it.

(2) Comparison with my properly tilled fields, and those parts of my estates to which less attention is given, convinces me of the correctness of this, viz.,

TOO FREQUENT CHANGES OF LEAVES ARE DUE TO LACK OF CULTIVATION

and not, as is popularly thought, to a condition of the weather.

(3) Trees in poor soil will shed leaves more often than those in good soil.

(4) Mulching, together with proper tillage operations, are the remedies suggested. With this I am in full accord. I recommended similar measures. . . . A plant can only absorb food materials which are dissolved in water; therefore if there is a lack of water, starvation may occur.

(5) I have noticed trees to change their leaves abnormally in cases of soil poverty, and this condition to

DISAPPEAR WHEN THE SOIL IS BUILT UP IN ORGANIC MATTER.

Continuing the discussion started in (Trinidad Agricultural) Society Paper 492, Mr. Henry Warner, in Paper 497, published the following notes, which are reproduced from the March issue of the Society's proceedings :—

"The primary cause of the abnormal 'changes of leaf' is the change of weather conditions, the principal contributory or secondary causes being want of proper cultivation and too much overhead shade, which also means a too extensive root system to be nourished by the limited available supply of plant

* There is some danger with mulches, especially of stable manure, to attract insects; to avoid this kainit can be recommended as it acts as an insecticide. In certain cases a small application of nitrate of soda by attracting moisture counteracts the effects of drought; see "Dry Farming," page 83, in May issue.

food." Mr Warner also calls attention to the marked changes in the climatic conditions. The wet and the dry seasons are far less marked than they formerly were, and if spells of "Indian summers," to use his own term, come in the midst of the wet season, so do short spells of wet occur when extreme dry heat prevails. All this is bound to affect the trees;

TO EXCITE OR RETARD THE FLOW OF SAP, AND HENCE CAUSE BOTH LEAVES AND PODS TO FALL.

The last time we were in the Tropics, having to visit an estate every week-end, we noticed this particularly. From Jannary, 1906, to May 1908, very few Sundays passed on which some rain did not fall. It may, at times, have been hardly noticeable, certainly not enough for an umbrella; at the same time rain did fall and showed that the "dry seasons" were not regular.

"All this tends to show, that with the enormous clearances of forest and woodlands that is going on every day throughout the Tropics, a new order of things as regards rainfall and climatic conditions must be looked for, and taken into consideration when planting up estates. If drains are needed during some months to run surplus water away from the estate, they may be needed at other times to serve as irrigation canals to conduct the water to the trees, and so equalize supplies. Although theorists can prove that ploughing between the trees damages the roots, practical men can show that, whilst this is true, the lack of cultivation, the absence of mulch, and the presence of excessive root-growth, brought about by

STRAINING AFTER SOIL-MOISTURE,

enfeeble the trees and reduce the yields far more than careful and judicious cultivation between the trees can ever affect them. So the old order of things changeth and new ideas must always be listened to and entertained."

Mr. Warner sums up as follows:—

"The principal causes of change of leaf are:

"(1) Vicissitudes of weather, hot sun and high winds, alternating with heavy 'plumps' of rain in our, so-called, wet season.

"(2) Excessive over-head shade with corresponding root-system, and insufficient nourishment to withstand sudden vicissitudes, in other words, we may say indifferent cultivation.*

"The remedies are:

"(1) Intensive cultivation and manuring.

"(2) Abolition of, or diminution of over-head shade, and substitution of wind-belts and hedges; and by the adoption of mulching and ground-shade."

In face of the above opinions, given by practical men, always in the land between the trees, planters troubled with excessive change of leaf, or loss of young pods, would do well at least to try tillage and manuring, as well as a clean mulch, before letting the troubl and its attendant short crops, go by as ireremediable. —*Tropical Life.*

* In our "Soil and Plant Sanitation," 11s. post free, and in "The Future of Cacao Planting," price 1s. 2d. post free, we deal very fully with the question of over-shading, and the evils of deforestation.

"SOME FACTS ABOUT CAMPHOR."

Yokohama, 1st July, 1912.

To the Editor, *Tropical Agriculturist*,

DEAR SIR,—*Re* "Some facts about Camphor" by Ambrose Warner (from the *Agricultural Journal of the Union of South Africa*, Vol. III, No. 1, January, 1912) reproduced in the *Tropical Agriculturist*, Vol. XXXVIII, April, No. 4, allow us to refute the defamatory remarks made therein on the Japanese Camphor seed stating that "The Japanese have a way of doctoring it before it leaves the country in order to prevent it germinating; a favourite dodge is to kiln-dry it." We are surprised to notice

such idea expressed by so high an authority. In our over twenty years' experience we have never heard of such practice really followed anywhere in Japan, positively not by seedsmen, whose interest is not at all concerned in the camphor manufacturing industry, whereas they have no benefit by protecting the Government monopoly which is a comparatively recent enactment, however patriotic the Japanese may be; but seedsmen will never do such suicidal practice in their own trade. The Government has no control on the seed distribution as the camphor trees are found everywhere in the southern fringe of Japan proper, where any one can collect the seed freely.

The idea of "doctoring" may emanate from the fact of the seed arriving injured at the destination so frequently, which we find to be due to its getting heated under tropical transit and ultimately losing the germinative power; however careful one may be in the treatment such is beyond one's control, and it is perfect injustice to judge that the seed has been "doctored" or boiled by us the Japanese.

Whatever may be said, one may not mind, as the demand for the seed has now ceased for export from Japan. Experience will prove that the seed is a very bad carrier, whether it be the Chinese or Ceylon production. Thanking for the insertion in your valuable paper.—Yours faithfully,

THE YOKOHAMA NURSERY COMPANY, LIMITED,

S. Iida, *Manager*.

[If our correspondent is alluding to us as the "high authority," we do not accept responsibility for the remarks objected to, not being the author of them. —Ed.]

MARKET RATES FOR TROPICAL PRODUCTS.

(From Lewis & Peat's Monthly Prices Current, London, 19th June, 1912.)

	QUALITY.	QUOTATIONS.
ALOES, Socotrine cwt.	Fair to fine ..	65s a 70s
Zanzibar & Hepatic ,,	Common to good ..	50s a 8 s 6d
ARROWROOT (Natal) lb.	Fair to fine ..	8d a 9d
BEES' WAX, cwt.		
Zanzibar Yellow ,,	Slightly drossy to fair ..	£7 a £7 2/6
East Indian, bleached ,,	Fair to good	£7 17/6 a £8 2/6
,, unbleached ,,	Dark to good genuine ..	£ 17/6 a £6 1 /6
Madagascar ,,	Dark to good palish	£6 17s 6d a £7 5s
CAMPHOR, Japan ,,	Refined	1s 6d a 1s 8½d
China ,,	Fair average quality ..	155s
CARDAMOMS, Tuticorin	Good to fine bold	4s a 4s 6d
	Middling lean	3s 2d a 3s 9d
Malabar, Tellicherry	Good to fine bold ..	4s 9d a 5s 3d
Calicut	Brownish	4s 2d a 4s 6d
Mangalore ,,	Med brown to fair bold	4s 3d a 5s 6d
Ceylon, Mysore ,,	Small fair to fine plump	3s 6d a 5s 3d
Malabar	Fair to good ..	3s 5d a 3s 8d
Seeds, E. I. & Ceylon ,,	Fair to good .	3s 10d a 3s 11d
Ceylon Long Wild ,,	Shelly to good ..	1d a 2s 9d
CASTOR OIL, Calcutta ,,	Good 2nds .	4d a 4½d
CHILLIES, Zanzibar cwt	Dull to fine bright ...	40s a 45s
Japan ,,	Fair bright small ..	28s 6d a 32s 6d
CINCHONA BARK.— lb.	Crown, Renewed	3⅜d a 7d
Ceylon	Org. Stem	2d a 6d
	Red Org. Stem	1½d a 4½d
	Renewed	3d a 5¼d
	Root	1⅞d a 4d
CINNAMON, Ceylon 1sts	Good to fine quill	1s 3d a 1s 7d
per lb. 2nds	,, ,,	1s 4d a 1s 6d
3rds	,, ,,	1s a 1s 5d
4ths	,, ,,	1s a 1s 4d
Chips, &c..	Fair to fine bold	2d a 3d
CLOVES, Penang lb.	Dull to fine bright pkd.	1 d a 1s 1d
Amboyna ..	Dull to fine	9d a 10d
Ceylon ..	,, ,,	7½d a 9d
Zanzibar	Fair and fine bright	7d a 7¼d
Stems ..	Fair	2½d
COFFEE		
Ceylon Plantation cwt.	Medium to bold	80s a 113s
Native	Good ordinary	Nominal
Liberian ,,	Fair to bold	75s a 85s
COCOA, Ceylon Plant. ,,	Special Marks	77s a 90s
	Red to good	69s a 75s
Native Estate ,,	Ordinary to red	40s a 70s
Java and Celebes ,,	Small to good red	25s a 80s
COLOMBO ROOT ,,	Middling to good	12s 6d a 17s 6d
CROTON SEEDS, sift. cwt.	Dull to fair	70s a 75s nom.
CUBEBS ,, ,,	Ord. stalky to good	1 0s a 170s
GINGER, Bengal, rough ,,	Fair	35s nom.
Calicut, Cut A ,,	Small to fine bold	82s 6d a 85s
B & C ,,	Small and medium	6 s a 8 s
Cochin Rough ,,	Common to fine bold	40s a 45s
	Small and D's	40s
Japan ,,	Unsplit	29s
GUM AMMONIACUM ,,	Ord. blocky to fair clean	40s a 72s 6d
ANIMI, Zanzibar	Pale and amber, str. sorts	£12 10s a £14 5s
	,, ,, little red	£11 a £12
	Bean and Pea size ditto	75s a £9 10s
	Fair to good red sorts	£7 a £9
	Med. & bold glassy sorts	£5 a £8
Madagascar ,,	Fair to good palish ..	£4 a £8 15s
	,, ,, red ...	£4 a £7 10s
ARABIC E. I. & Aden ,,	Ordinary to good pale	35s a 45s nom.
Turkey sorts ,,		42s 6d a 65s
Ghatti ,,	Sorts to fine pale ...	25s a 35s nom.
Kurrachee ,,	Reddish to good pale ...	27s 6d a 35s ,,
Madras ,,	Dark to fine pale ..	27s 6d a 35s ,,
ASSAFŒTIDA ,,	Clean fr. to gd. almonds	£10 a £12
	com. stony to good block	50s a £9
KINO	Fair to fine bright	6d a 1s
MYRRH, Aden sorts cwt	Middling to good	52s 6d a 62s 6d
Somali ,,	,, ,,	50s a 5 s 6d
OLIBANUM, drop ,,	Good to fine white	45s a 50s
	Middling to fair	35s a 40s
pickings ,,	Low to good pale	12s 6d a 27s 6d
siftings ,,	Slightly foul to fine	2 s a 22s 6d
INDIA RUBBER lb.	Fine Para bis. & sheets	4s 10d
	,, Ceara ,, ,,	s 9d
Ceylon, Straits, Malay Straits, etc.	Crepe ordinary to fine..	4s 10d a 5s
	Fine Block ..	4s 10½d
	Scrap fair to fine ..	3s 11d a 4s 2d
Assam	Plantation ..	4s
	Fair II to ord. red No. 1	3s 4d a 3s 10d
Rangoon	,, ,, ,,	2s a 3s

	QUALITY.	QUOTATIONS
INDIARUBBER (*Contd.*)		
Borneo	Common to good	1s 9d a 2s 9d
Java	Good to fine red .	3s 6d a 3s 8d
Penang	Low white to prime red	1s 6d a 2s 8d
Mozambique	Fair to fine red ball ..	3s 10d a 4s 6d
	Sausage, fair to good .	3s 6d a 4s 5d
Nyassaland	Fair to fine ball .	s a 4s
Madagascar	Fr to fine pinky & white	2s 9d a 3s 4d
	Majunga & blk coated ..	2s a 2s d
	Niggers, low to good	6d a 3s 3d
New Guinea	Ordinary to fine ball ..	2s 6d a 3s 6d
INDIGO, E.I. Bengal	Shipping mid to gd violet	3s 2d a 3s 8d
	Consuming mid. to gd.	2s 6d a 3s
	Ordinary to middling	's 3d a 2 6d
	Oudes Middling to fine	2s 6d a 2/8 nom.
	Mid. to good Kurpah	2s 2d a 2s 6d
	Low to ordinary	1s 6d a 2s
	Mid. to fine Madras	None here
MACE, Bombay & Penang per lb.	Pale reddish to fine	2s 3d a 2s 6d
	Ordinary to fair	2s a 2s :d
Java	,, ,, good pale	2s a 2s 4d
Bombay	Wild	6d a 7d
MYRABOLANES, cwt	UG and Coconada	4s 6d a 5s 6d
Bombay ,,	Jubblepore	4s 10½d a 7s
	Bhimlies .	4s 10½d a 7s 3d
	Rhajpore, &c.	4s 6d a 6s
Bengal ,,	Calcutta	4s a 5s
NUTMEGS— lb.	64's to 57's	10d a 1s
Singapore & Penang ,,	80's	7d
	110's	5½d
NUTS, ARECA cwt.	Ordinary to fair fresh	14s a 15s
NUX VOMICA, Cochin	Ordinary to good	9s 6d a 12s 6d
per cwt. Bengal	,, ,,	8s 6d
Madras	,, ,,	8s 6d a 9s
OIL OF ANISEED ,,	Fair merchantable	5s 7d
CASSIA ,,	According to analysis	3s 5d a 3s 8d
LEMONGRASS ,,	Good flavour & colour	4⅜d
NUTMEG ,,	Dingy to white	1½d a 1⅜d
CINNAMON ,,	Ordinary to fair sweet	2⅛d a 1s 4d
CITRONELLE ,,	Bright & good flavour	1s 0⅜d
ORCHELLA WEED—cwt		
Ceylon ,,	Fair ..	10s Nom.
Madagascar ,,	Fair ...	10s ,,
PEPPER (Black) lb.		
Alleppy & Tellicherry	Fair ...	5⅝d a 5¾ l
Ceylon ,, ,,	,, to fine bold heavy ..	5½d a 5⅝d
Singapore .	Fair	5⅜d
Acheen & W. C. Penang	Dull to fine	5½d a 6d
(White) Singapore ,,	Fair to fine	8½d a 9d
Siam ,,	Fair	8½d
Penang ,,	Fair	7½d
Muntok ,,	Fair	8¾d
RHUBARB, Shenzi ..	Ordinary to good ..	1s 9d a 2s 9d
Canton ..	Ordinary to good ..	1s 5d a 1s 8d
High Dried..	Fair to fine flat ...	9d a 10½d
	Dark to fair round ..	7½d a 8½d
SAGO, Pearl, large ...	Fair to fine	18s a 19s
medium ..	,, ,,	17s a 18s 6d
small ...	,, ,,	14s 6d a 15s
SEEDLAC cwt	Ordinary to gd. soluble	45s a 60s
SENNA, Tinnevelly lb	Good to fine bold green	5d a 8½d
	Fair greenish	3d a 4½d
	Commonspeckyand small	1¼d a 2½d
SHELLS, M. o'PEARL—		
Egyptian cwt.	Small to bold ...	90s a £10 12s 6d
Bombay ,,	,, ,, ...	75s a £ 0 2s 6d
Mergui ,,	,, ,, ..	£15 a £.7 10s
Manilla ,,	Fair to good ..	£11 5s a £16 7/6
Banda ,,	Sorts	46s a 52s 6d
TAMARINDS, Calcutta...	Mid. to fine bl'k not stony	9s a 12s
per cwt. Madras	Stony and inferior ..	4s a 5s
TORTOISESHELL—		
Zanzibar, & Bombay lb.	Small to bold ..	12s a 33s
	Pickings	13s 6d a 28s
TURMERIC, Bengal cwt.	Fair	22s
Madras ,,	Finger fair to fine bold bright	24s a 26s
Do. ,,	Bulbs	18s a 20s
Cochin ,,	Finger fair .	0s
	Bulbs ...	16s
VANILLOES— lb.		
Mauritius .. 1sts	Gd crystallized 3½ a 8½ in	13s a 18s 6d
Madagascar ... 2nds	Foxy & reddish 3½ a ,,	13s a 16s
Seychelles ... 3rds	Lean and inferior ...	12s 6d a 13s 6d
VERMILLION ..	Fine, pure, bright ..	2s 11d
WAX, Japan, squares	Goodhite hard ...	45s